Chapter 3 • Affected Environment

Chapter 3: Affected Environment

3.0 INTRODUCTION

The purpose of this chapter is to describe the environmental resources of the Beaver Dam Wash NCA and the Red Cliffs NCA that could be affected by the implementation of the alternatives presented in Chapter 2. The descriptions are presented separately for each NCA and include information about the legal and regulatory framework that applies to each resource value or use, as well as past and current management practices. Also included here are descriptions of authorized land uses that provide economic and social benefits to individuals and local communities. Where specific information about resource conditions or uses is not available for the NCAs, the best available county-wide or regional data are used.

This chapter also includes descriptions of those resource values and land uses that could be impacted by the alternatives developed for the Amendment to the 1999 SGFO RMP. The Amendment is limited to two issues; the resources and uses described in the Affected Environment reflect the narrow scope of this planning process. For each of the three planning efforts considered in this chapter, the Affected Environment descriptions provide the baseline conditions for Alternative A (No Action), against which the potential impacts of the other "action alternatives" are compared in Chapter 4 of the Draft EIS.

Certain types of resources that are present in other BLM planning areas, such as wild horses and burros, are not present in either of the two NCAs or on other public lands managed by the SGFO. Therefore, these resources are not described in this chapter. Similarly, certain uses of public lands, including the filing of new mining claims and the subsequent development of those claims, oil and gas leasing, and development, and mineral materials harvesting, can no longer be authorized in the Beaver Dam Wash NCA and Red Cliffs NCA, based on Congressionally-mandated withdrawals of the public lands included in OPLMA Sections 1974 and

Photo 3-1 Chuckwalla in Red Cliffs NCA

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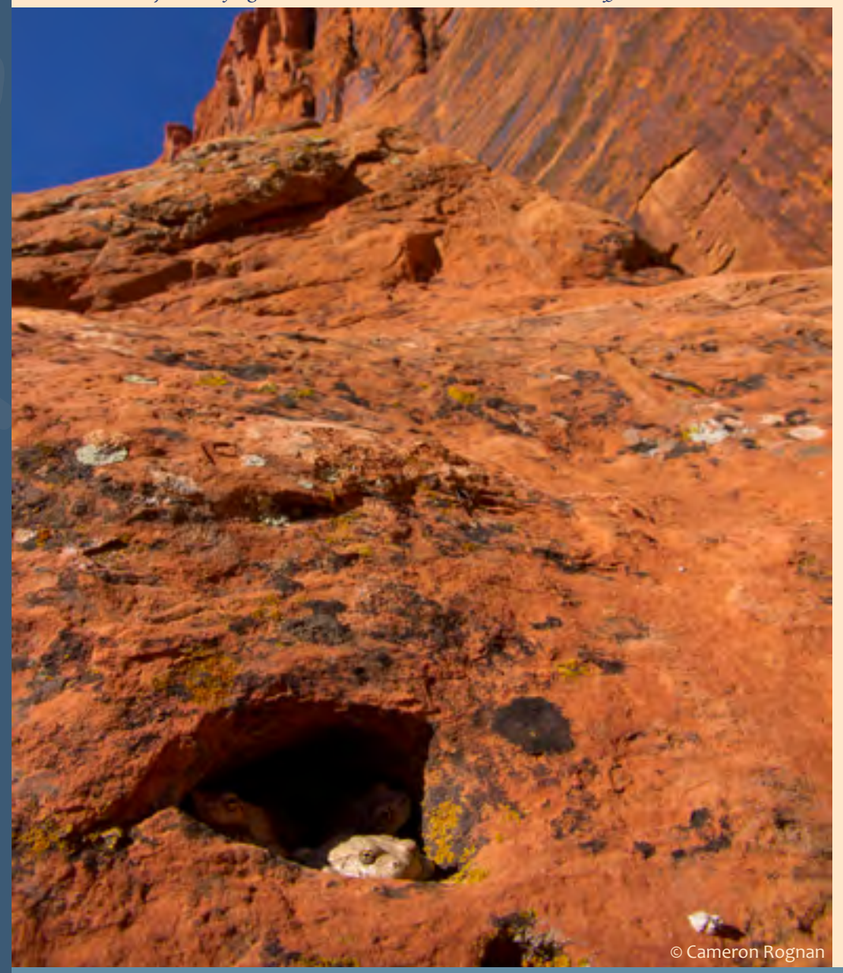
Chuckwalla

Sauromalus ater evades predators by retreating into a narrow rock crevice and inflating its lungs, wedging itself tightly into place to make its removal difficult. Chuckwallas are diurnal, or active during the day, and can usually be found basking on boulders.

1975. These uses are not described in this chapter. Those mining claims in Beaver Dam Wash NCA and Red Cliffs NCA that were active at the time of NCA designation in 2009 could be developed at a future time if development complies with the regulatory requirements outlined in 43 CFR 3809 and 3715.

Information from broad-scale assessments was used to develop the environmental setting and resource descriptions for each planning area. The level of detail presented in this chapter is sufficient to assess the potential effects discussed in Chapter 4 and is based on the alternative management actions identified in Chapter 2. Acreage figures and other data provided are approximate projections and readers should not infer that they reflect exact measurements or precise calculations. These figures and data were calculated using GIS technology and there may be slight variations in total acres for resource values or uses. The environmental values, resource uses, special designations, and social and economic conditions in this chapter appear in the same order as they are presented in Chapters 2 and 4.

Photo 3-2 Canyon Treefrogs Nestled into a Sandstone Crevice, Red Cliffs NCA



© Cameron Rognan

Canyon Treefrog

Hyla arenicolor is a relatively small frog with large adhesive toe pads. During the day or dry periods, look for them in rock crevices or on rock faces. In the spring or summer it is not uncommon to find several of these frogs nestled together, lining a shallow rock crevice. On warm evenings, they can be found near the water's edge. At dusk they climb down from their day perch and move towards water to forage or breed. (Brennon 2014)

Chapter 3: Affected Environment BDWNCA

3.1 AIR QUALITY

The State of Utah's Division of Air Quality (UDAQ), through delegated authority from the U.S. Environmental Protection Agency (EPA), implements the Clean Air Act (CAA) which regulates air quality, collects air quality data through monitoring stations, and establishes ambient air quality standards for criteria air pollutants. These pollutants include carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone, lead, and particulate matter (PM) less than or equal to 10 microns in size (PM10), and PM less than or equal to 2.5 microns in size (PM2.5). Air quality monitoring is emphasized by UDAQ in more developed areas of the state where attainment of established criteria could be problematic. The Utah Air Monitoring Network currently includes monitoring stations in Washington County (UDAQ 2013).

Attainment status indicates that air quality in an area meets the National Ambient Air Quality Standards (NAAQS); nonattainment status indicates that air quality in an area does not meet those standards. Data from EPA and UDAQ monitoring stations collected over several years are used to determine whether specific geographic regions meet attainment or nonattainment status for regulated air pollutants.

Lands in Washington County have been designated as either attainment areas or unclassified areas for all pollutants. Unclassified areas do not have enough approved air monitoring data to make a formal attainment determination, but are regulated in the same manner as attainment areas. Washington County has also been designated a Prevention of Significant Deterioration (PSD) Class II area. The PSD program sets maximum allowable increases in concentrations of all pollutants regulated under the CAA. The maximum allowable increases in concentrations in Classes I, II, and III areas are those increments specified in Utah Air Conservation Rule R307-405-4 for each pollutant. The increment is the amount that the concentration is allowed to increase over a baseline set for new or modified sources. In no case may a change result in concentrations that are higher than the lowest applicable NAAQS.

3.1.1 Air Quality Monitoring Data

Air quality data is not currently being collected in the NCA; the nearest UDAQ monitoring sites are located in the cities of Santa Clara and Hurricane, Utah, approximately 15 miles to the north and 40 miles east of the NCA. Table 3-1 displays multi-year air quality monitoring data collected from these two sites. Additional air monitoring data from the Santa Clara site can be found at EPA's Air Data website (EPA 2014) and from the UDAQ air monitoring website (UDAQ 2014). The air quality data collected for the greater St. George area is generally applicable to the NCA.

Table 3-1 Summary of Air Quality Data Collected in Hurricane and Santa Clara, UT

Pollutant	Latest Year	Averaging Time	Maximum Average Period Concentrations
Ozone (O3)[1]	2012	8 hour	0.075 ppm[3]
Particulate Matter (PM10)[1]	1998	Annual	43 µg/m3
Particulate Matter (PM10)[1]	1998	24 hour	19 µg/m3
Carbon Monoxide (CO)[1]	1998	8 hour	4 ppm
Nitrogen Oxides (NOx)[2]	2012	Annual	0.022 ppm

1Monitored in Hurricane at 147 North 870 West—latest data available
2Monitored in Santa Clara at 1215 N Lava Flow Drive—latest data available
34th highest 8 hour value

"I love the feeling of the fresh air on my face and the wind blowing through my hair."
–Evil Knievel, Entertainer/Daredevil, 1938–2007

The National Park Service also collects air quality data for ozone and particulates in Zion National Park, located in eastern Washington County. In 2012, the fourth highest 8 hour ozone (O_3) concentration was 0.075 ppm. Also, in 2012 the 98th percentile 24-hour PM2.5 concentration was 12.1 µg/m3 (UDEQ 2014). Regional haze has also been an issue of growing concern in the western United States as it obscures the clarity, color, texture, and form of what can be seen. Visibility monitoring data were collected for four years (2000-2004) at Zion National Park (IMPROVE 2011) and indicated that visibility improved slightly during the monitoring period.

Ambient concentrations of Hazardous Air Pollutants (HAPs) as defined under the National Emission Standards for Hazardous Air Pollutants (NESHAPs), such as benzene and formaldehyde, are not known at this time, but are assumed to be quite low due to the low population and small number of potential sources located in Washington County. HAPs are generally highest, and of most concern, in urban areas with high population densities and/or near point sources of specific HAPs (e.g. smelters).

Ozone concentrations in southwest Utah and across most of the American southwest approach the current NAAQS for ozone during the summer season in some years. Elevated ozone concentrations in the planning area are most likely heavily influenced by transport of ozone and ozone precursor gases from sources outside the area, which is also a common occurrence throughout the southwest. Particulate concentrations appear to be well below the NAAQS for PM10 and PM2.5, although short-term high concentrations may occur during episodic high wind events. These episodic event concentrations may not show up in the monitoring record, as they can be classified as exceptional or natural events and not be reported on the official record used to determine compliance with the NAAQS. In summary, air quality is excellent in the planning area, though it may be negatively impacted by transport of pollutants from outside the area and from high wind events.

Since the public lands of the NCA are not near large communities, air quality is generally good (Photo 3-3). Regionally-produced haze can impair visibility at times, most commonly during the summer months. This haze typically originates in the metropolitan areas south and west of the NCA, including Las Vegas, Nevada; Los Angeles, California; and Phoenix, Arizona. In the winter, northerly airflows bring clear air into

"Since the public lands of the NCA are not near large communities, air quality is generally good."

Photo 3-3 West Mountain Peak Visible 10 Miles from Beaver Dam Wash NCA

southwestern Utah improving air quality and visibility. Short-term air pollution can result from smoke, particulates, and gases from wildfires and the burning of fields on private lands in nearby Beaver Dam and Littlefield, Arizona (Photo 3-4). Fugitive dust may also contribute to short-term air quality degradation, particularly when vehicle travel on the many unimproved roads of this region occurs during high wind events; fugitive dust is not included in air quality evaluations.

3.1.2 Air Quality Emissions Data

State-wide emission inventories are updated every three years, with the latest published inventory in 2011 (UDAQ 2013). Emissions for Washington County are shown in Table 3-2, and are relatively small compared to more urban areas of the state and region. There are no significant major point sources of emissions in Washington County (>100 tons/year), and the majority of emission sources are considered area sources comprised of small businesses, mobile emissions (cars and trucks), combustions sources (heaters and boilers), and vegetation (volatile organic compounds (VOC) emission from plants). The largest point source in Washington County is the Kern River natural gas pipeline compressor station, located near Veyo, Utah, but is not considered a major source under the CAA.

Windblown dust is not included in the emissions inventories as it is a sporadic source that cannot be well defined quantitatively. Fugitive dust from off-road activities is also not included in the emissions inventory for the same reason.

3.1.3 Climate

Climate is described using data collected about daily, seasonal, and annual weather conditions in a specific region averaged over several decades. These data help to

Table 3-2 Triennial Inventory (ton/year) Washington County 2011

	CO	NOx	PM10	PM25	SOx	VOC
Area Source	1,817.60	287.60	2,599.63	689.86	39.76	2,223.34
Non-Road Mobile	6,707.96	702.15	92.55	87.82	3.05	1,191.01
On-Road Mobile	16,927.00	4,038.00	929.16	323.91	18.02	1,766.80
Point Source	67.75	225.31	99.41	32.24	19.08	23.68
Biogenics	8,632.70	0	0	0	0	52,151.54
Wildfires	463.14	13.19	56.04	50.43	0	79.11
Total	34,616.16	5,266.24	3,776.78	1,184.27	79.91	57,435.49

"Regionally-produced haze can impair visibility at times, most commonly during the summer months. This haze typically originates in the metropolitan areas south and west of the NCA, including Las Vegas, Nevada; Los Angeles, California; and Phoenix, Arizona."

Photo 3-4 Haze Obscures Visibility from Beaver Dam Wash NCA Towards Las Vegas

"A lot of people like snow. I find it to be an unnecessary freezing of water."
–Carl Reiner, Writer, Director, 1922–

Photo 3-5 Winter Storm in Beaver Dam Wash NCA

identify trends in precipitation, temperature, wind speed and direction, relative humidity, and solar radiation.

The climate of the northeastern Mojave Desert, in which the NCA is located, is semi-arid and characterized by low precipitation, low humidity, bright sunshine, and wide diurnal variations in temperature. Elevation and topographic relief influence temperature and precipitation gradients, with lower temperatures and higher levels of precipitation typifying higher elevation zones. Relative humidity varies by season, with the lowest humidity occurring in early summer (15-40%) and the highest humidity during the winter months (40-60%). Prevailing winds are generally from the west-southwest, although local topography influences wind direction. Cool air typically flows down mountain slopes into the valleys at night, reversing to upslope flows as temperatures rise during the day.

Summers in this area are typically hot, dry, and sunny, with daily high temperatures from 90-100° Fahrenheit (F) depending on elevation. Winter daily highs average between 45-55°F at the lowest elevations of the NCA; winter daily low temperatures are generally between 20-30°F, and can dip below freezing at higher elevations. Southwestern Utah averages more than 200 frost-free days per year, with the last frosts of the spring typically occurring at the end of March and the first frosts of the year at the beginning of October.

Table 3-3 displays precipitation data collected over a 26 year period from BLM rain gauges at two locations in the NCA. These data indicate that average annual precipitation varies by elevation, with an annual average of 8.91 inches being recorded near Beaver Dam Wash (the lowest point in the NCA) and 10.03 inches in the foothills of the Beaver Dam Mountains. They also clearly show the extreme variability in annual precipitation (e.g., from 2.36 inches in 2002 to 22.26 inches in 2005, measured at the Beaver Dam gauge) that typifies the Mojave Desert ecoregion. At elevations above 5,500 feet the area receives occasional snowfalls that cover the higher slopes (Photo 3-5), increasing the annual average precipitation to approximately 14 inches (Western Regional Climate Center 2014). Monsoonal storms are common in late summer and can cause localized flash flooding.

Table 3-3 Annual Precipitation Data Collected from Rain Gauges

YEAR	BEAVER DAM (INCHES)	CASTLE CLIFF (INCHES)
1987	5.62	9.51
1988	10.80	13.86
1989	4.66	6.14
1990	9.61	10.27
1991	6.45	8.35
1992	13.59	15.93
1993	14.88	13.70
1994	7.44	10.35
1995	13.34	14.85
1996	3.84	4.32
1997	10.03	12.40
1998	11.22	16.56
1999	5.99	11.13
2000	5.48	7.14
2001	9.35	9.80
2002	2.36	2.92
2003	6.49	7.04
2004	7.20	7.53
2005	22.26	24.89
2006	6.81	8.87
2007	5.54	5.77
2008	6.48	7.40
2009	6.15	8.34
2010	9.75	10.03
2011	14.75	15.67
2012	10.58	10.89
2013	9.90	13.40

3.1.4 Climate Change

Certain gases in the atmosphere trap energy reflected by the Earth's surface, creating a "greenhouse effect." As concentrations of these greenhouse gases (GHGs) increase, the earth's surface warms, the atmosphere changes composition, and global climate is affected. Concentrations of greenhouse gases have increased dramatically in the earth's atmosphere in the past century. Anthropogenic (man-made) sources and human activities have been attributed to these increases particularly for carbon dioxide, methane, nitrous oxide, and fluorinated gases (USEPA 2010).

The EPA has determined that six GHGs are air pollutants and subject to regulation under The CAA: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Of these GHGs, carbon dioxide, methane, and nitrous oxide are commonly emitted by the types of activities included in this analysis, while the remaining three GHGs are emitted in extremely small quantities or are not emitted at all. Greenhouse gas emissions from management actions and activities were estimated for each alternative in this analysis for the following pollutants:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)

Several activities contribute to the phenomena of climate change, including emissions of GHGs (especially carbon dioxide and methane), large wildland fires and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of carbon dioxide can influence climate for 100 years. The IPCC's latest report (IPCC 2014) states that the equilibrium climate sensitivity is likely in the range 1.5° Celsius (C) to 4.5° C (high confidence), extremely unlikely less than 1°C (high confidence), and very unlikely greater than 6° C (medium confidence). No best estimate for equilibrium climate sensitivity can now be given because of a lack of agreement on values across assessed lines of evidence and studies. The climate sensitivity specifically due to CO_2 is often expressed as the temperature change in °C associated with a doubling of the concentration of carbon dioxide in Earth's atmosphere. This can take decades to centuries to be fully expressed.

The temperature of Earth's atmosphere is regulated by the amount of solar

"We need to start by having a conversation about climate change. It would be irresponsible to avoid the issue just because it's uncomfortable to talk about."
–Al Franken, United States Senator, 1951–

radiation that the planet receives and the effects of GHGs. Over the past century, Earth's climate has warmed by 1.5°F, with the average global surface temperature increasing at a rate greater than in any of previous nine centuries (Beschta et al. 2012). Emissions of GHGs from human activities are believed to be a primary cause of this change. In the American West, climate change is predicted to intensify even if greenhouse gas emissions are dramatically reduced (IPCC 2007).

Scientists are using computer models and simulations to predict future trends and changes in Earth's climate. The most widely accepted climate change scenarios indicate increases in global ambient temperatures, more intense heat waves, new wind patterns, decreased snowpack and seasonal runoff, and worsening drought conditions in some areas and higher precipitation in others (IPCC 2007). An estimated 20-30% of animal and plant species may be at risk of extinction due to habitat loss, wildfires, flooding, disease, and pest outbreaks (The Nature Conservancy 2010).

Even subtle climate changes would likely have large impacts on fragile desert ecosystems, like the Mojave Desert, where species are already living in extreme conditions of heat and aridity. As part of an agency-wide strategy to adapt to future climate change, BLM completed a rapid ecological assessment (REA) for the Mojave Desert in 2013 (Nature Serve 2013). The Mojave REA predicts that most of the ecoregion will be affected by changes in temperature and possibly by changes in precipitation regimes.

Elevated temperatures and altered precipitation patterns may cause valuable water sources to dry up seasonally or completely, and may also change stream flow and the recharging of groundwater basins. Small changes in water temperature could reduce the viability of native fish populations and other aquatic species. Epps et al. (2004) predicted that populations of desert bighorn sheep living in lower, drier mountain ranges, such as those in the NCA, may be more susceptible to extirpation than those living in higher, moister mountain ranges.

Summer thunderstorms may increase in number and/or intensity, causing flooding and changing the growth patterns, productivity, and distribution of native and non-native plant species. Modeling completed for precipitation as part of the Mojave REA (NatureServe 2013) did not show a statistically significant change, but did suggest that there could be a slight upward trend in the amount of fall precipitation.

In the Mojave Desert, mean and extreme temperatures are likely to increase, thus decreasing the moisture levels in the soil even if precipitation remains unchanged. Climate space trend modeling generated as part of the Mojave REA (Nature Serve 2013) showed that statistically significant increases in temperatures have already occurred and are predicted to continue to occur. Because different species respond differently to changes in climate and other habitat factors, native communities will change in species composition and in elevational distribution. Studies in the Newberry Mountains of southern Nevada (Guida 2011) have shown that pinyon pine (*Pinus monophylla*) appears to have shifted its range upward in elevation by 75 meters, while Mojave yucca (*Yucca schidigera*) has moved 30 meters upslope. The protection of a large network of undeveloped and connected landscapes has been recommended as a management strategy that could help to ensure that species have opportunities to move to more favorable habitats in response to climate change (The Nature Conservancy 2010).

If hotter and drier conditions do prevail, some vegetation growth in the Beaver Dam Wash and Red Cliffs NCAs would likely be less abundant, particularly native forbs, grasses, and annuals that rely on early spring precipitation events to trigger sprouting and development. Depending on the extent and rapidity of the change, some elements of the native flora may disappear entirely. The very small pinyon pine-juniper woodland in the Beaver Dam Mountains could be changed to a shrubland or be lost completely. With a drier climate, changes in seasonal precipitation patterns could occur and drought years could become more prevalent. These changes could benefit the weedy exotic species (e.g., brome grasses), that can sprout after fall precipitation events and more quickly produce seeds than many native grass species. Wildfires would likely be more frequent and larger in scale, converting late seral stage shrublands to invasive grasslands (Photo 3-6). Groundwater recharge would diminish under reduced precipitation scenarios, eventually causing springs and surface flows in Beaver Dam Wash to disappear.

This climate change scenario would result in less forage, water, and shade cover being available for herbivorous species, including the threatened desert tortoise. Decreased seed production would negatively impact many insects, birds, rodents, and small mammals that rely on seeds as their dietary staples. Raptors and other carnivores that prey on these species would also experience population declines.

The NPS recently completed climate change modeling that focused on four native species found in Zion National Park and Cedar Breaks National Monument: American pika (*Ochotona princeps*), desert tortoise (*Gopherus agassizi*), Shivwits milkvetch (*Astragulus ampullariodes*), and Great Basin bristlecone pine (*Pinus longaeva*) (Shovic and Thoma 2011). Under various modeling scenarios, such as increased mean annual temperature and changed precipitation patterns, American pika could be extirpated from Zion National Park. Desert tortoises would also face extinction, as their habitat would be lost or become too fragmented to allow for natural migration to more favorable areas. Shivwits milkvetch, an endangered and endemic native plant, would be at high risk of extinction as ambient temperatures rise, as would bristlecone pine.

"Even subtle climate changes would likely have large impacts on fragile desert ecosystems, like the Mojave Desert, where species are already living in extreme conditions of heat and aridity."

"You can no longer say that the climate of the future is going to be like the climate of today, let alone yesterday."
–Judi Greenwald, Deputy Director for Climate, Environment, and Energy Efficiency, U.S. Department of Energy

Photo 3-6 Wildfire Damaged Landscape in Beaver Dam Wash NCA

3.2 WATER RESOURCES

3.2.1 Hydrologic Units

Three hydrologic units overlap the NCA (Map 3-1). The Bull Valley Mountains and Beaver Dam Mountains in Utah and the Clover Valley Mountains in eastern Nevada create a massive watershed that drains into the Beaver Dam Wash and carries perennial and ephemeral flows to the Virgin River at a confluence near Beaver Dam, Arizona.

3.2.2 Water Resources

Water resources include surface and groundwater sources located within major watersheds. In accordance with Section 303(d) of the Clean Water Act (CWA), and in cooperation with the EPA, the Utah Department of Environmental Quality (UDEQ) establishes water quality standards and designated uses for surface waters in the state. These standards include acceptable levels for turbidity, pH, trace metals, salinity and other total dissolved solids (TDS), bacterial levels, and sediment loads. The UDEQ reports on streams and rivers that are not meeting water quality standards for their designated uses, identifies the cause(s) of impairment, and calculates a total maximum daily load (TMDL) for water bodies not meeting standards. Surface water resources on public lands are managed to ensure that water quality standards are not exceeded as a result of BLM actions or land use authorizations.

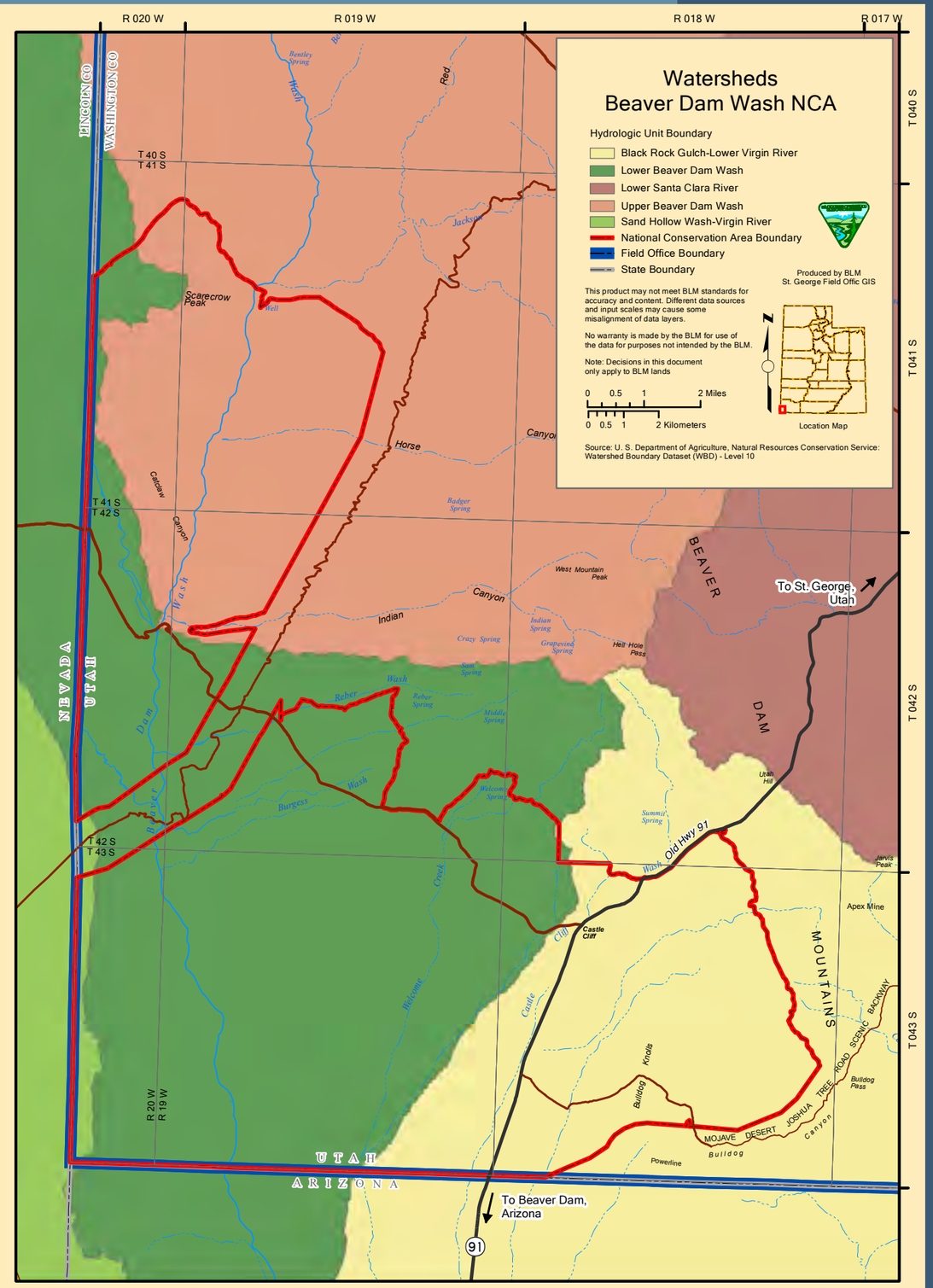
3.2.3 Surface Water

Stream flows in the Beaver Dam Wash (Photo 3-7) are the only significant surface water source in the NCA (Map 3-1). Originating in the Bull Valley Mountains of southwestern Utah, Beaver Dam Wash meanders west into Nevada, then returns to Utah, where it flows south to join the Virgin River in Arizona. The stream of the Beaver Dam Wash, with its deeply incised 200 foot high channel, flows north-south through the NCA for a distance of approximately 17 miles. The channel ranges from approximately 1,500 feet wide at the northern boundary of the NCA to 2,500 feet wide near the Utah-Arizona state line. Tributaries to the Beaver Dam Wash include the West Fork (a perennial stream that arises in Nevada) and the East Fork (a perennial stream that originates on the Dixie National Forest and drains southwesterly into the Wash). Surface water travels through the NCA during periods of seasonal runoff and after intense monsoonal storms, but is otherwise present yearlong only in the upper reaches of Beaver Dam Wash, north of the NCA.

Stream flows in the upper Beaver Dam Wash are derived from the discharge of ground water in the channel alluvium and are generally consistent in quantity and quality, varying little throughout the year. Surface flows also result from periodic precipitation events, with the duration of surface flow dependent on the type of event. For example, summer monsoonal storms are brief, high-intensity rainfall events that can produce significant amounts of short-term runoff and surface flows. In contrast, winter storms generally are longer duration

Photo 3-7 Surface Water in Beaver Dam Wash, Beaver Dam Wash NCA

"A river seems a magic thing. A magic, moving, living part of the very earth itself."
–Laura Gilpin, American Photographer, 1891-1979



"In the arid environment of the northeastern Mojave Desert in southwestern Utah, springs and seeps were historically crucial for the survival of wildlife, as well as for the perseverance of Native American peoples."

events that produce runoff for several days. Ephemeral washes convey seasonal and intermittent flows, augmenting the volume of surface flows collected by the Beaver Dam Wash.

UDEQ has identified the beneficial use of surface flows of the Beaver Dam Wash as being for warm water aquatic life (3B). Based on biennial assessments by UDEQ, Beaver Dam Wash meets the water quality standards for this use.

3.2.3.1 Springs and Seeps

In the arid environment of the northeastern Mojave Desert in southwestern Utah, springs and seeps were historically crucial for the survival of wildlife, as well as for the perseverance of Native American peoples. Beginning in the early decades of the 20th century, these surface water sources were developed by Anglo-European settlers and flows diverted through pipelines in order to water domestic livestock (Photo 3-8) that grazed on public lands, often leaving little or no water at the source.

Welcome Spring is the only spring complex known to occur on public lands within and near the NCA and is located along its northwestern boundary. Seepage occurs along the base of a limestone outcrop at multiple locations in the narrow canyon of Welcome Spring Wash; at two locations, water is captured and piped for use by livestock that graze in the Beaver Dam Slope and Castle Cliffs Allotments. A narrow zone of riparian vegetation is also sustained by seepage and seasonal runoff in Welcome Spring Wash.

Photo 3-8 Livestock Water Trough, Beaver Dam Wash NCA

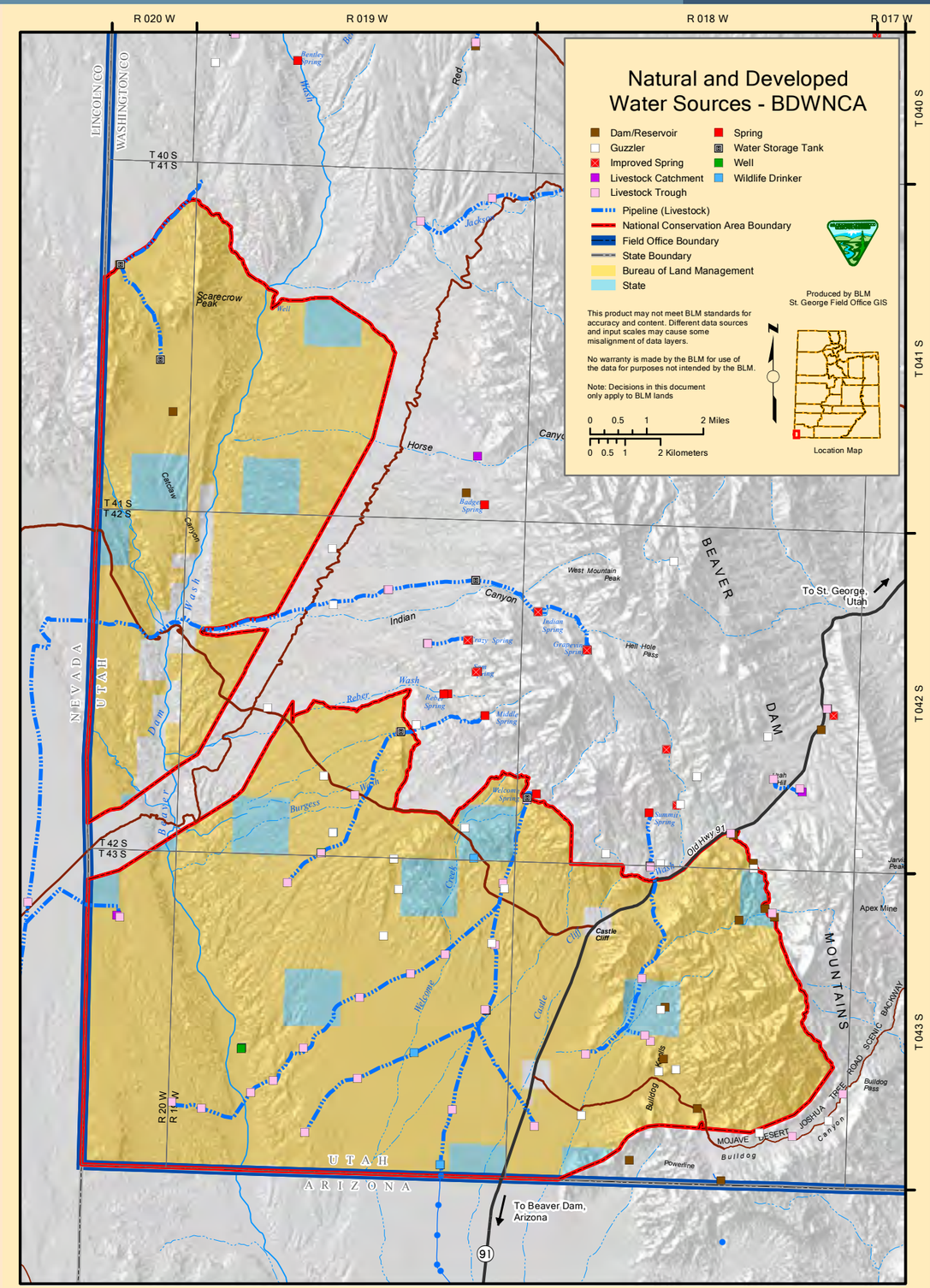
As the NCA has not been systematically inventoried to identify all springs and seeps on public lands, there is some likelihood that additional surface water sources may be present. Other springs and constructed reservoirs located outside of the NCA boundaries supply water through long-distance pipe systems for domestic livestock and wildlife use within the NCA. Map 3-2 displays all natural and developed water sources within and immediately adjacent to the NCA.

3.2.4 Ground Water

In the NCA, the main hydrologic units consist of the Quaternary alluvial channel-fill deposits, the Quaternary basin-fill deposits, and the Tertiary Muddy Creek Formation.

The Quaternary alluvial channel-fill deposits are the most important water-producing unit in the Beaver Dam Wash. Alluvial deposits, ranging in thickness from approximately 60 feet to over 100 feet, create a shallow channel-fill aquifer that stores groundwater (Holmes et al. 1997). The water in the alluvial channel-fill deposits is in hydraulic connection with surface water and wetland/riparian areas. Ground water occurs in the channel-fill aquifer along the entire length of the drainage. Recharge into the channel-fill aquifer occurs from three sources: surface flow infiltration in the main channel, seasonal and intermittent surface flows carried along a network of ephemeral drainages that drain to Beaver Dam Wash, and inflow from sand and gravel deposits adjacent to the stream.

The Quaternary basin-fill post Muddy Creek deposits include the extensive



"Thousands have lived without love, not one without water."
–W. H. Auden, Poet, 1907–1973

Quaternary alluvial fan deposits consisting of poorly to moderately sorted, boulder to clay-sized sediment shed from the adjacent rock units with moderately developed caliche or hard pan. These basin-fill deposits are hundreds of feet thick, incised by the Beaver Dam Wash by as much as 300 feet, and generally unsaturated north of the Virgin River.

The Muddy Creek Formation underlies these deposits and extends to depths of thousands of feet. The upper part of the formation is a thin to thick bedded calcareous siltstone, sandstone, and calcrete. Its fine-grained nature generally restricts groundwater movement in the Beaver Dam Wash area.

Groundwater quality is evaluated primarily on the amount of TDS: the lower the TDS amounts, the higher the water quality. The ground water in the Beaver Dam Wash channel alluvium and surface flows in this drainage are low in TDS and, therefore, of good quality.

One groundwater well is on public land within the NCA, and water is pumped to benefit domestic livestock use in the Beaver Dam Slope Allotment.

3.2.5 Water Rights and Beneficial Uses

OMPLA (Section 1975) did not reserve water for the NCA nor did it remove any water rights held by the federal government that existed at the time of NCA designation. Consequently, the NCA designation had no effect on valid existing water rights, either for BLM or other water rights holders.

BLM holds a perfected water right to beneficially use 0.015 cfs of groundwater from a well on public lands in the floodplain of Beaver Dam Wash within the NCA for the benefit of domestic livestock that graze the Beaver Dam Slope Allotment.

BLM also holds a perfected water right for 0.0234 cfs of surface flows from Welcome Springs (WR #81-696) located along the boundary of the NCA; an additional water right of 0.015cfs on Welcome Springs is held by the Santa Clara Cattlemen's Association. The beneficial use for this water is for livestock in the Beaver Dam Slope and Castle Cliffs Allotments, and for limited domestic use. A pipeline from Welcome Springs services the Beaver Dam Slope and Castle Cliffs Allotments. The main line, located within the Beaver Dam Slope Allotment, is approximately 6 miles long and provides water for livestock at five locations. Two spur lines, totaling approximately 8 miles in length provide water at seven additional sites within the same allotment. A third spur supplies water at one location in the Castle Cliffs Allotment.

3.3 GEOLOGIC AND PALEONTOLOGICAL RESOURCES

3.3.1 Physiography

The NCA is located at the convergence of the Great Basin section of the Basin and Range physiographic province and the High Plateau section of the Colorado Plateau physiographic province. The Great Basin section is characterized by north-south trending mountain ranges separated by intervening valleys (basins) with internal drainage. The ranges are typically tilted, fault-bounded crustal blocks that were elevated above the adjacent valleys due to past episodes of faulting during the Miocene (23.5 to 5.3 million years ago (MYA)). The High Plateau section of the Colorado Plateau is characterized by high, north-south trending plateaus and mesas separated by faults.

Photo 3-9 Ephemeral Drainage Amid Alluvial fans, Beaver Dam Wash NCA

In southwestern Utah, the north-south trending mountain ranges are of different ages and lithologies (i.e., rock units). Some are young ranges composed of volcanic rocks, such as basalt, andesite, and tuffs. The Bull Valley Mountains, located north of the NCA, are one example of this type; these mountains were created approximately 25 MYA by volcanic eruptions and were subsequently uplifted by tectonic events approximately 10 MYA. Other ranges, such as the Beaver Dam Mountains, are composed of very old sedimentary and metamorphic rocks that have been uplifted, folded, and faulted by recent tectonic events. These mountains, located along the northeastern boundary of the NCA, are primarily composed of Paleozoic age limestone and other sedimentary rocks that range in age from Tertiary to Precambrian, and were thrust upward by movement along the Grand Wash Fault approximately 10 MYA.

The NCA is comprised of contrasting landforms, including broad, sloping alluvial fans, ephemeral drainages, and the rocky slopes of the Beaver Dam Mountains (Photo 3-9). Elevations range from 2,200 feet above mean sea level (ASL) in the Beaver Dam Wash at the Utah-Arizona state line, to approximately 6,300 feet ASL on peaks of the Beaver Dam Mountains within the NCA. Alluvial fans cover approximately 55% of the land base of the NCA and are composed of deposits eroded from the Beaver Dam and Bull Valley Mountains in Utah, as well as weathered materials from the Clover Valley Mountains and Tule Spring Hills in Nevada that were transported and redeposited by the Beaver Dam Wash. The Beaver Dam Wash is a major topographic landform in the NCA and a tributary to the Virgin River; the confluence with the Virgin River occurs in Arizona, approximately 7 miles south of the Utah state line.

3.3.2 Geologic Structure

The NCA is located at the convergence of the Great Basin section of the Northern Basin and Range physiographic province and the Colorado Plateau. The Basin and Range physiographic province is characterized by east-west extensional tectonics that formed the distinctive topography of north trending linear mountain ranges separated by intervening valleys (basins). Mountain ranges are typically tilted fault bounded crustal blocks that were elevated above the adjacent valleys due to past episodes of faulting during the Miocene (23.5 to 5.3 MYA).

The Beaver Dam Wash NCA is comprised of contrasting landforms, including broad, sloping alluvial fans, ephemeral drainages, and the rocky slopes of the Beaver Dam Mountains.

The oldest rocks in the Beaver Dam Wash NCA and in southwestern Utah are the 1.7 billion year old Precambrian gneiss, schist, amphibolite, and pegmatite of the Beaver Dam Mountains anticline.

Approximately 140 MYA to 50 MYA thrust faulting and folding formed the 10 mile long Beaver Dam Mountains anticline, the prominent structural feature of the NCA. Along the southwest flank of the Beaver Dam Mountains, detached and attenuated Paleozoic rocks within the upper plate of the Late Cenozoic Castle Cliff detachment fault rest on Precambrian, Paleozoic, and Tertiary bedrock in extensional denudation fault relationships.

The Castle Cliff detachment and gravity-slide blocks document rapid and major uplift of the Beaver Dam Mountains during the late Miocene age. The gravity-slide blocks contain large blocks of brecciated and attenuated Mississippian Redwall limestone derived from the upper plate of the Castle Cliff fault present in the NCA (Biek et al. 2009).

Major extensional faulting about 13 MYA resulted in the development of the Mesquite graben-basin along the west side of the Beaver Dam Mountains. The Piedmont/Red Hollow fault (Beaver Dam-Virgin Mountains fault), although not exposed, is inferred by geophysical and geologic data to be a basin and range normal fault that bounds the western flank of the Beaver Dam Mountains and the Mesquite Basin. This graben-basin was filled with several thousand feet of erosional debris of which only a few hundred feet have been exposed by erosion by the Virgin River and its tributaries, including the Beaver Dam Wash. The Mesquite Basin, at more than 21,000 feet based on seismic and gravity data, is one of the deepest in the Basin and Range Province.

3.3.3 Geologic Formations

The geologic formations of the NCA are briefly described below and their locations shown on Map 3-3. Outstanding geologic features are natural rock structures such as monuments, arches, faults, and mud cracks having uncommon, rare, or exceptional aesthetic, educational, or scientific value, or well-known markers for historic events or sensitive cultural areas.

3.3.3.1 Precambrian Gneiss, Schist, Amphibolite, and Pegmatite

The oldest rocks in the NCA and in southwestern Utah are the 1.7 billion year old Precambrian gneiss, schist, amphibolite, and pegmatite of the Beaver Dam Mountains anticline. The most extensively exposed rock type is dark gray gneiss consisting of amphibole, feldspar, quartz, and pyroxene. The granite pegmatite intrudes both the schist and gneiss principally parallel to the foliation.

These Precambrian basement rocks are exposed on the west side of the range and outcrop along the northeast boundary of the NCA over a distance of 6 miles, from Reber Wash to Castle Cliff Wash. They are comparable to the Vishnu and Brahma schists of the Grand Canyon and Precambrian rocks in the North Virgin and East Mormon Mountains.

3.3.3.2 Tapeats Sandstone

The Lower Cambrian age Tapeats sandstone is a ledge-forming reddish-orange to reddish-brown quartzite with a few thin beds of quartz-pebble conglomerate. It is about 1,300 feet thick in the Beaver Dam Mountains and was deposited in intertidal and near shore environments.

3.3.3.3 Bright Angel Shale

The overlying Bright Angel shale is an olive-green micaceous shale, siltstone, and fine-grained quartzose sandstone. The upper contact is conformable and gradational with a Cambrian limestone and dolomite sequence of the Bonanza King Formation and Nopah Dolomite. The limestones are in the basal part of the succession and grade upward into massive dolomites. The alternating dark and light gray limestone and dolomite section totals over 3,900 feet in thickness, but these rocks are typically so faulted and brecciated that finding a complete section is rare.

3.3.3.4 Nopah Dolomite

The Upper Cambrian Nopah Dolomite is a light gray to brownish-gray dolomite. The formation looks very similar to the underlying Bonanza King rocks but is more massive and forms steeper ledges and cliffs. The formation contains algal stromatolites in the upper part and small tubular trace fossils and mottled zones that suggest bioturbation during deposition in a warm shallow-marine environment.

3.3.3.5 Bonanza King Formation

The Upper and Middle Cambrian Bonanza King Formation is a medium to light brownish–gray dolomite with some bluish-gray limestones in the lower portion that crop out in the eastern part of the NCA.

3.3.3.6 Muddy Peak Dolomite

The Devonian Muddy Peak Dolomite has been divided into a slope forming member, an olive-gray to yellowish-gray silty dolomite, and a gray massive dolomite that contains scattered chert nodules (known as the Pinnacle Member). It weathers to form hoodoos or pinnacles below the massive gray Redwall Limestone cliffs.

3.3.3.7 Redwall Limestone/Monte Cristo Formation

The Mississippian Redwall Limestone is a locally fossiliferous, massive, cliff-forming, gray, thick bedded, locally cherty, marine limestone (Photo 3-10). The middle section of the unit contains minor interbedded sandstone and dolomite. The Redwall is one of the most easily recognized units in the area and is at least 615 feet thick. The limestone is exposed in the southeast part of the NCA, and gravity-slide blocks appear on the Castle Cliffs fault along the northeast boundary of the NCA over a distance of 6 miles, from Reber Wash to Castle Cliff Wash. The Monte Cristo Formation is mapped only west of Beaver Dam Wash along the Nevada–Utah state line near Scarecrow Peak and is a stratum equivalent to the Redwall Limestone.

3.3.3.8 Callville Limestone

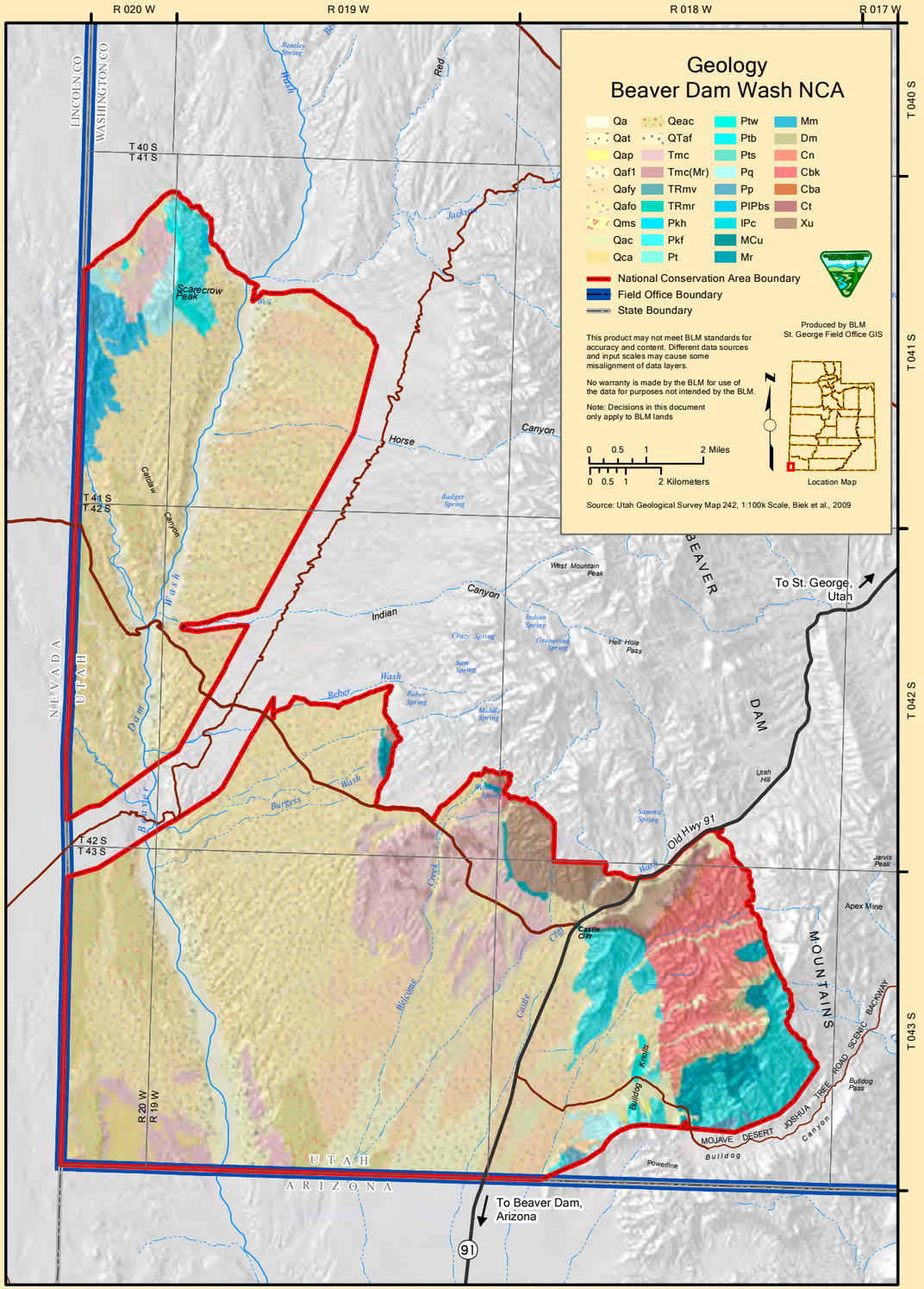
The Pennsylvanian age Callville Limestone is a resistant, light to medium gray and light blue-gray, thin to thick bedded, commonly cherty, fossiliferous, shallow-marine limestone (Photo 3-11). It forms cliffs or ledge and step topography. It locally contains thin beds of light orange sandstone and light gray dolomite in the upper third of the formation, and has a maximum thickness of about 1,500 feet. The Callville Limestone is exposed only in the Beaver Dam Mountains in the southeast part of the NCA.

Photo 3-10 Redwall Limestone, Beaver Dam Mountains

Photo 3-11 Fossilized Fusilinids in Callville Limestone, Beaver Dam Wash NCA

Fusilinids

Found in the Pennsylvanian age Callville Limestone, fusilinids were highly complex single-celled organisms, about the size and shape of a grain of wheat. Scientists believe that fusilinids lived in shallow tropical and sub-tropical carbonate rich waters.



Geologic Formations
Beaver Dam Wash NCA

- Qa - River and stream deposits
- Qat - Old river and stream deposits
- Qap - Pediment deposits
- Qaf1 - Level-1 alluvial-fan deposits
- Qafy - Younger alluvial-fan deposits
- Qafo - Older alluvial-fan deposits
- Qms - Landslide deposits
- Qac - Alluvial and colluvial deposits
- Qca - Colluvial and alluvial deposits
- Qeac - Mixed eolian and alluvial deposits with well-developed calcic soils
- QTaf - Oldest alluvial-fan deposits
- Tmc - Muddy Creek Formation
- Tmc(Mr) - Large slide blocks of Redwall Limestone in Muddy Creek Formation
- TRmv - Virgin Limestone Member of Moenkopi Formation
- TRmr - Rock Canyon Conglomerate Member of Moenkopi Formation
- Pkh - Harrisburg Member of Kaibab Formation
- Pkf - Fossil Mountain Member of Kaibab Formation
- Pt - Toroweap Formation
- Ptw - Woods Ranch Member of Toroweap Formation
- Ptb - Brady Canyon Member of Toroweap Formation
- Pts - Seligman Member of Toroweap Formation
- Pq - Queantoweap Sandstone
- Pp - Pakoon Dolomite
- PIPbs - Bird Spring Formation
- IPc - Callville Limestone
- MCu - Redwall Limestone and Bonanza King Formation, undivided
- Mr - Redwall Limestone
- Mm - Monte Cristo Limestone
- Dm - Muddy Peak Dolomite
- Cn - Nopah Dolomite
- Cbk - Bonanza King Formation
- Cba - Bright Angel Shale
- Ct - Tapeats Quartzite
- Xu - Gneiss, schist, and pegmatite

Source: Utah Geological Survey Map 242, 1:100k Scale, Biek et al., 2009

3.3.3.9 Pakoon Dolomite/ Bird Spring Formation

The Lower Permian age Pakoon Dolomite a resistant, light gray and light yellow, thick bedded, fine grained, shallow-marine dolomite. It commonly weathers to light brownish-gray and blue-gray, thin to thick bedded, commonly cherty, fossiliferous, shallow-marine limestone. It forms cliffs or ledge and step topography. The Pakoon Dolomite is exposed only in the Beaver Dam Mountains in the southeast part of the NCA. The Bird Spring Formation is mapped only west of Beaver Dam Wash along the Nevada–Utah state line near Scarecrow Peak, and are strata equivalent to the Pakoon Dolomite and Callville Limestone.

3.3.3.10 Queantoweap Sandstone

The Permian Queantoweap Sandstone is a yellowish-brown, pale orange, thick bedded and cross-bedded, fine to medium grained sandstone that was deposited in shallow-marine, beach, and dune environments. The Queantoweap Sandstone is exposed in the Beaver Dam Mountains in the southeast part of the NCA and along the Nevada–Utah state line near Scarecrow Peak in the northwest part of the NCA.

3.3.3.11 Toroweap Formation

The Permian age Toroweap Formation consists of three members: Woods Ranch, Brady Canyon, and Seligman. The units are exposed in fault bounded and highly fractured blocks in the Beaver Dam Mountains in the southeast part of the NCA and along the Nevada–Utah state line near Scarecrow Peak in the northwest part of the NCA. These Permian age rocks were deposited when the St. George area lay just north of the equator and the then flat landscape consisted of shallow warm seas, coastal beaches, and sabkhas (i.e., sea level areas with high evaporation rates, such as today's Arabian Peninsula) (Biek et al. 2009).

The Woods Ranch Member is an interbedded, laterally variable slope forming yellowish-gray to light gray, thin bedded dolomite and black chert, gypsum, gypsiferous mudstone, limestone, and collapse breccia with a local conglomerate or breccia at the base. These rocks were deposited in sequence of shallow marine and sabkha environments. The

Photo 3-12 Queantoweap Sandstone (foreground), Brady Canyon Member (middle mountain), and Fossil Mountain Member (top mountain), Beaver Dam Wash NCA

"I don't drink water, because if water can erode rock, think what it can do to flesh."
–Jarod Kintz, Author, 1982–

Woods Ranch Member is about 160 to 230 feet thick.

The Brady Canyon Member is a light to medium gray, thick bedded, fossiliferous, limestone and cherty limestone deposited in a shallow-marine environment. It forms prominent cliffs and ranges.

The Seligman Member is a yellowish-brown, locally gypsiferous, fine grained, sandstone and siltstone slope forming unit formed in sabkha or near shore environments.

3.3.3.12 Kaibab Formation

The Early Permian age Kaibab limestone consists of the Harrisburg and Fossil Mountain Members and is exposed in the Beaver Dam Mountains in the southeast part of the NCA and along the Nevada–Utah state line near Scarecrow Peak in the northwest part of the NCA.

The Harrisburg Member is composed of thin to thick bedded gypsum, gypsiferous mudstone, limestone, and cherty limestone about 100 to 160 feet thick. These rocks were deposited in sequence of shallow-marine and sabkha environments.

The Fossil Mountain Member is a light gray, thick bedded, fossiliferous,

Photo 3-13 Redwall Limestone of Muddy Creek Formation, Beaver Dam Wash NCA

limestone and cherty limestone deposited in a shallow-marine environment. Its distinctive "black- banded" look is created by the abundance of reddish-brown, brown, and black chert, making it one of the most easily recognized units in the area. The member is one of the most resistant units, forming prominent cliffs that range in height from 200 to 290 feet.

3.3.3.13 Moenkopi Formation

Overlying the Kaibab limestone is the Triassic age Moenkopi Formation. A few members of the Moenkopi Formation are present along the NCA boundary just north of Scarecrow Peak. The Rock Canyon Conglomerate Member and the Virgin Limestone Member are exposed in a few isolated outcrops.

The Virgin Limestone Member is a light gray and yellowish–brown limestone and silty limestone that typically forms three thin resistant ledges at the base, middle, and top of the member. Most of the member consists of variable gray, yellowish-gray, and grayish-purple mudstone and siltstone that form intervening slopes between the limestone ledges. The rock unit was deposited in a variety of shallow-marine environments.

The Rock Canyon Conglomerate Member consists of a pebble to cobble, clast supported conglomerate derived from the Harrisburg Member of the Kaibab Formation.

3.3.3.14 Muddy Creek Formation

The Miocene age Muddy Creek Formation consists of mostly fine grained to coarse grained, grayish-orange to pinkish-orange and medium reddish-brown calcareous sandstone, siltstone, mudstone, and moderately sorted conglomerates (Photo 3-13). It also contains minor light gray to white airfall and water-lain tuff beds less than 3 feet thick, and hardpan or calcrete horizons as much as 3 to 6 feet thick. The Muddy Creek Formation is exposed in outcrops on about 7.6% of the NCA area. It is

"Observe always that everything is the result of change, and get used to thinking that there is nothing nature loves so well as to change existing forms and to make new ones like them."
–Marcus Aurelius, Roman Emperor, 121–180 AD

"Geology gave us the immensity of time and taught us how little of it our own species has occupied."
–Stephen Jay Gould, Author, 1941–2002

exposed in the northwest part of the NCA by Scarecrow Peak, along the eastern boundary of the NCA, on the west flank of the Beaver Dam Mountains, and near the Arizona border along the Beaver Dam Wash.

The formation includes gravity-slide blocks on the west flank of the Beaver Dam Mountains. Large blocks of tectonically thinned, brecciated Redwall Limestone are incorporated in both the coarse and fine grained faces of the Muddy Creek Formation at the west edge of the Beaver Dam Mountains. The blocks are preserved in structurally high areas in the footwall of local faults, showing that the blocks were emplaced prior to unroofing of the Beaver Dam Mountains. The gravity-slide blocks in the embayment west of Welcome Spring appear to be disturbed through several hundred feet of Muddy Creek in strata, suggesting multiple episodes of emplacement in late Miocene time (Biek et al. 2009).

The Muddy Creek Formation was deposited as closed-basin-fill sediment in the Virgin River depression and other connected basins south and west. It is poorly to well cemented, and generally forms slopes, except where protected by younger, resistant calcic slopes. The Beaver Dam Wash contains mostly sedimentary rock of this formation—the result of erosion and faulting.

3.3.3.15 Surficial Deposits

Quaternary age alluvial, colluvial, and eolian deposits comprise 64% of the NCA area (Photo 3-14). The alluvial deposits are primarily derived from coalesced fans of material weathering from the Beaver Dam Mountains and Bull Valley Mountains in Utah, as well as the Clover Mountains and Tule Spring Hills in eastern Nevada.

Figure 3-1 displays the stratigraphic column for the NCA (Hayden 2005).

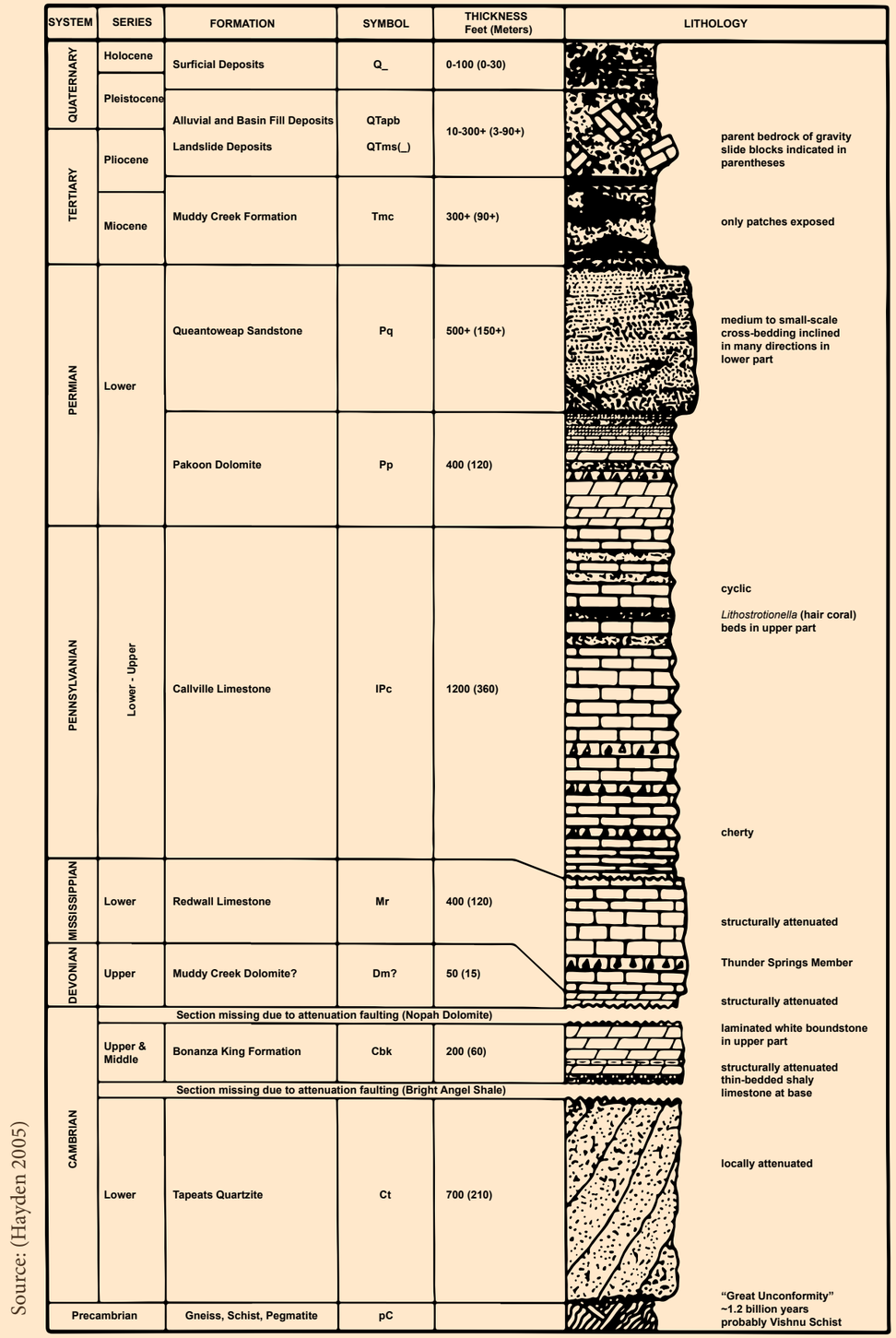
3.3.4 Paleontological Resources

Paleontological resources are managed by BLM for their scientific, educational, and recreational values. By law, paleontologists and other scientists who are working under permits issued by BLM may collect or excavate vertebrate fossils, trackways, and noteworthy occurrences of fossilized invertebrates or plants (refer to Appendix C for a listing of the federal laws that apply).

Prior paleontological inventories in the NCA have been very limited in scope and have not yet identified localities containing vertebrate or plant fossils. Some of

Photo 3-14 Quaternary Age Alluvial-fan Deposits Beaver Dam Wash NCA

Figure 3-1 Stratigraphic Column for Beaver Dam Wash NCA



Source: (Hayden 2005)

"The worse the country, the more tortured it is by water and wind, the more broken and carved, the more it attracts fossil hunters, who depend on the planet to open itself to us. We can only scratch away at what natural forces have brought to the surface."

–Jack Horner, Paleontologist, 1946–

the geologic formations of the Beaver Dam Mountains, such as the Vishnu schist, predate all life forms and are not expected to contain fossils. In other formations, the geologic processes of faulting, volcanism, and crustal deformation have destroyed any biological materials that were present, eliminating the potential for preservation as fossils. In addition, some potential fossil-bearing units have been buried by more recent Quaternary age alluvial deposits.

A Potential Fossil Yield Classification (PFYC) system is used by BLM to rate the potential of geologic units to contain significant fossil resources. This classification system predicts that fossils might be found in particular formations on the basis of past scientific experience. Five classes were developed for this system, with Class I having very low potential for containing significant fossils and Class V having very high potential. The Miocene age Muddy Creek Formation, Permian Kaibab, and the Cambrian Bright Angel Shale have moderate potential (PFYC Class 3) for significant paleontological resources. Table 3-4 displays the paleontological resources that are predicted to be present within each geological formation present in the NCA.

Table 3-4 Paleontological Resources by Geologic Formation

Age	Formation/Unit Name	Lithology	Fossils Present
Quaternary 0-1.5 MYA	Surficial deposits, includes pediment, alluvial, colluvial, eolian, and lacustrine	Gravel/sand/clay	Vertebrate: vertebrates in localized lacustrine and fluvial deposits, possible fossilized packrat middens.
Pliocene-Miocene 1.5-25 MYA	Muddy Creek Formation and Basin Fill Sedimentary Rocks	Sandstone/siltstone/mudstone/conglomerate	Vertebrate: low abundance but certain horizons containing burrows, camel tracks and camel bones have been reported nearby in Nevada.
Triassic 206-245 MYA	Moenkopi Formation	Sandstone/siltstone/mudstone/gypsum/limestone/conglomerate at base	Invertebrate, Vertebrate, Plant: some petrified wood noted and locally fossiliferous (crinoids, gastropods, brachiopods, and ammonites in Virgin Limestone/Timpoweap Members, rare vertebrate in red beds).
Permian 245-286 MYA	Kaibab Limestone (includes Harrisburg and Fossil Mountain Members)	Limestone/cherty/limestone/ gypsum/siltstone	Invertebrate: crinoids, bryozoans, mollusks, echinoids, and brachiopods.
Permian 245-286 MYA	Toroweap Formation (includes Wood Ranch Member, Brady Canyon, and Seligman Members)	Limestone, dolomite, gypsum, gypsiferous mudstone and siltstone/Brady Canyon is cherty limestone and fossiliferous limestone	Invertebrate: crinoids, gastropods, and brachiopods
	Queantoweap Sandstone	Sandstone	None reported
	Pakoon Formation (includes Bird Spring Formation west of the Beaver Dam Wash)	Dolomite/dolomitic limestone/limestone	Invertebrate: bryozoans, fusilinids, and crinoids in thin limestone beds.
Pennsylvanian 286-320 MYA	Callville Limestone (includes Bird Spring Formation west of the Beaver Dam Wash)	Limestone, calcareous siltstone, sandstone, dolomite (commonly cherty and fossiliferous limestone)	Invertebrate: coral (*Chaetetes* spp.) are common in the upper part, and other corals, brachiopods, echinoderms, and bryozoans are common throughout.
Mississippian 320-408 MYA	Redwall Limestone (includes Monte Cristo Limestone west of the Beaver Dam Wash)	Cherty and fossiliferous/ bioclastic limestone	Invertebrate: horn corals, colonial corals, echinoderms, and brachiopods.
Devonian 380-408 MYA	Muddy Peak Dolomite	Dolomite, silty dolomite and sandstone	Invertebrate: Stromatoporoid-like structures/rare biothermal mounds that include crinoid, coral, gastropod, and brachiopod fragments.
Cambrian 505-570 MYA	Nopah Dolomite	Dolomite	Invertebrate: algal stromatolites, tubular trace fossils.
	Bonanza King Formation	Dolomite/silty limestone	Invertebrate: none known in the Beaver Dam Wash NCA but a trilobite was reported near the top of the formation in the Virgin Gorge.
	Bright Angel Shale	Micaceous shale, siltstone, quartzose sandstone	Invertebrate: None known in the Beaver Dam Wash NCA but trilobites have been found at nearby sites in Nevada and Arizona.
	Tapeats Quartzite	Orthoquartzite/pebble conglomerate	Invertebrate: None reported in the Beaver Dam Wash NCA to date.
Precambrian 570-4550 MYA	Vishnu schist equivalent (1.7 billion years old)	Gneiss, schist, pegmatite	Invertebrate: None reported in the Beaver Dam Wash NCA to date.

"Whatever Nature undertakes, she can only accomplish it in a sequence. She never makes a leap."

–Johann Wolfgang von Goethe, Poet, Zoologist, Botanist, Geologist, 1749–1832

Federal Cave Resources Protection Act of 1988 (United States Code 16 USC Sec. 4301) Title 16 Chapter 63 states that: The Congress finds and declares that (1) significant caves on Federal lands are an invaluable and irreplaceable part of the Nation's natural heritage; and (2) in some instances, these significant caves are threatened due to improper use, increased recreational demand, urban spread, and a lack of specific statutory protection.

(b) Purposes. The purposes of this Act are (1) to secure, protect, and preserve significant caves on Federal lands for the perpetual use, enjoyment, and benefit of all people; and (2) to foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on Federal lands for scientific, education, or recreational purposes.

(c) Policy. It is the policy of the United States that Federal lands be managed in a manner which protects and maintains, to the extent practical, significant caves.

3.4 CAVE AND KARST RESOURCES

A cave is defined as any naturally occurring void, cavity, recess, or system of interconnected passages occurring beneath the surface of the earth that is large enough to permit an individual to enter, regardless of whether the entrance is naturally formed or human-made. A cave resource is any resource occurring within a cave. Cave resources can be biological, geological, mineralogical, paleontological, cultural, hydrological, or any other attribute specific to that cave. Caves are complex and sensitive ecosystems because of the fragility of their components (i.e., paleontological and archaeological deposits, speleothems (formations inside caves (Photo 3-15)),

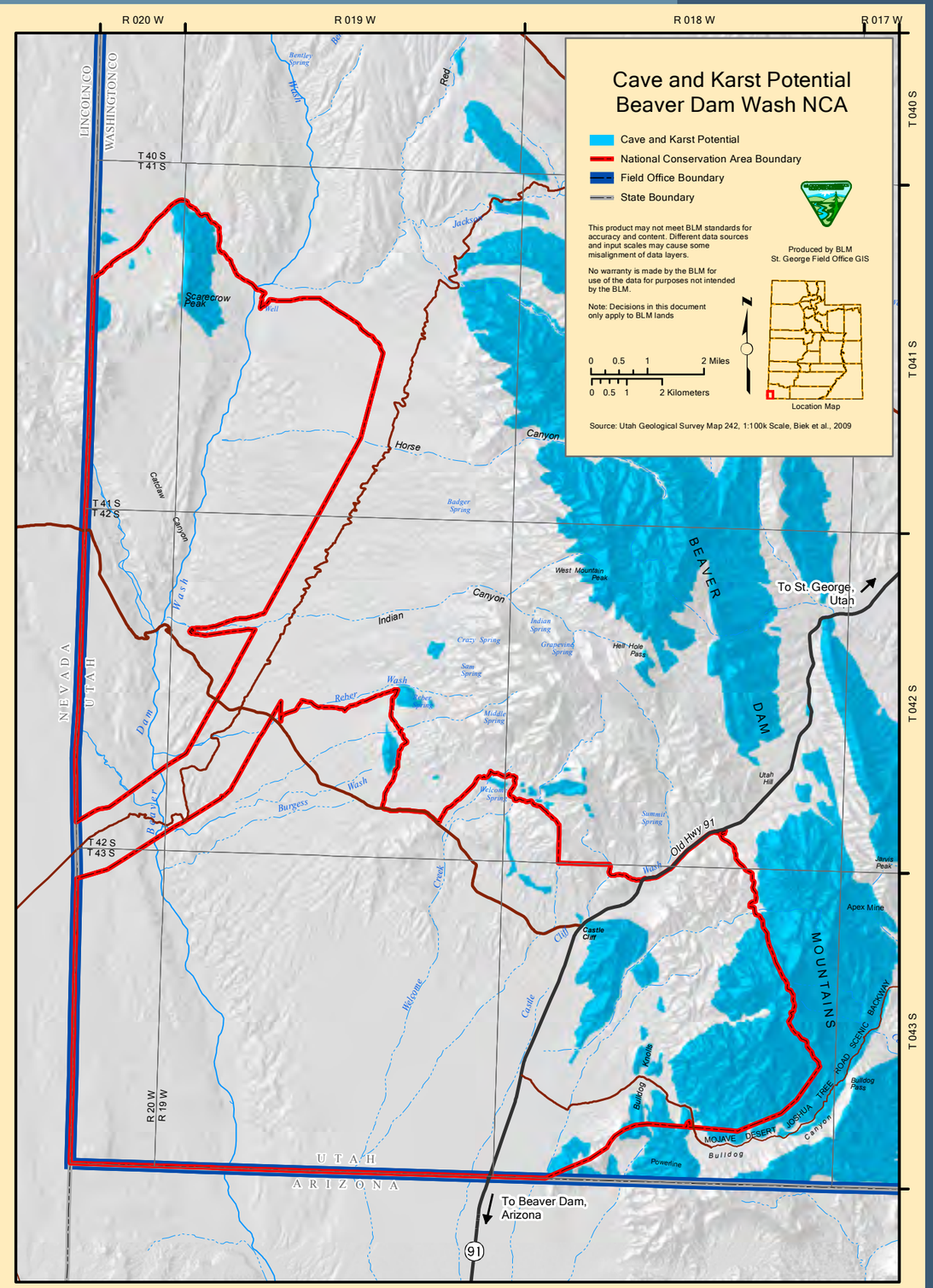
Photo 3-15 Speleothems in Sunbeam Cave, Beaver Dam Wash NCA

and biological resources, the great length of time required to respond to changes in conditions, and the delicate balance of interactions between cave resources and foreign inputs (i.e., surface communities and resources, groundwater hydrological systems, etc.).

A karst is a landform produced by the dissolution of soluble rock types such as limestone, dolomite, marble, gypsum, or salt (Photo 3-16). Features often associated with karst terrains include sinkholes or closed depressions, blow holes, caves, dry valleys, sinking streams, and resurgences or springs.

The Beaver Dam Mountains are composed primarily of Pennsylvanian, Mississippian, and Devonian age limestone units. Erosion of these limestone units, especially the Mississippian Redwall limestone, has created large and significant caves and karsts, as well as other unique geological features such as sinkholes and extensive systems of joints and lineaments. Diverse ecosystems with unusual cave-adapted invertebrate and vertebrate species are often present within the caves and karsts of the Beaver Dam Mountains. Map 3-4 shows the areas of the NCA that have the highest potential for caves and karsts to be present.

Photo 3-16 Redwall Limestone Karst Terrain, Beaver Dam Wash NCA



"Nature is painting for us, day after day, pictures of infinite beauty."
–John Ruskin, Art Critic, 1819–1900

Photo 3-17 Sunbeam Cave Inventory, Beaver Dam Wash NCA

Fourteen caves have been identified in the Beaver Dam Mountains within the boundaries of the NCA through limited cave inventories (Photo 3-17); two additional caves are located along the boundary of the NCA. The 14 caves on public lands, ranging in length from 30 to 110 feet, have not been inventoried to determine what cave resources are present. Given the many large caves that have been identified elsewhere in the Beaver Dam Mountains and at other locations where the Redwall limestone is exposed, there is a high potential for additional caves to be found within the NCA, and for some of these caves to contain important geological, biological, and cultural resources.

3.5 SOIL RESOURCES

Many resources and resource uses depend on the presence of suitable and quality soils for their sustainability and continued health; therefore, soil attributes and condition are important to BLM management decisions. The Utah Standards and Guides (Appendix D) identify attributes of healthy and functioning soils based on soil type, land form, geologic processes, and climate.

Desert soils tend to be poorly developed with a high content of mineral particles and little organic matter. This is caused by low plant productivity, which restricts the soil-building properties of microorganisms that convert organic matter into the humus components of soils. In the arid desert conditions that prevail at all but the highest elevations, there is little downward movement of the soluble constituents of the soil. Most leaching is confined to the translocation of the soluble material (usually lime) from the surface to the subsoil with the resultant formation of a hardpan. These soluble salts are usually leached to a depth of only one to two feet.

In this climate, soil formation occurs due to rock weathering by disintegration rather than by decomposition. Mechanical breakdown of rock formations is more common than chemical action; as a result, mountains are covered with a thin veneer of rock fragments. Storm events move large volumes of material into washes and valleys, forming

Photo 3-18 Typical Desert Pavement in Beaver Dam Wash NCA

alluvial fans of the coarser material. The fine material is washed into the lowlands.

Soil erosion involves two processes: (1) a detachment or loosening influence, and (2) transportation by means of floating, rolling, dragging, and splashing. Freezing and thawing, flowing water, and rain impact provide the detaching agents. Raindrop splash and especially running water can carry away loosened soil. On comparatively smooth soil surfaces, the beating of raindrops results in most of the detachment. In the vegetation types offering generally sparse cover, little interception of precipitation or protection from overland flow of water occurs.

As is the case for water erosion, the loss of soil by wind movement also involves detachment and transportation. The abrasive action of the wind results in some detachment of tiny soil grains from the granules or clods of which they are a part. When the wind is laden with soil particles, its abrasive action is greatly increased. The impact of these rapidly moving grains dislodges other particles from soil clods and aggregates. The cutting and abrasive effects upon tender leaves and vegetation are harmful, especially the effects of sand.

Aeolian landforms are produced by wind erosion, transportation, and deposition of fine-grained sediment. These landforms are formed into islands of small sand dunes and sheets, which are often habitats for special status vegetation species.

Desert pavements are prominent features in arid environments and consist of a surface layer of closely packed gravel that overlies a thin, gravel-poor soil horizon (Photo 3-18). These structures, along with their silt-and clay-rich texture, control infiltration and hence the overall hydrologic conditions in the soil profile. Desert pavement clasts rise vertically on an accreting eolian mantle, and the underlying vesicular horizon co-evolves with pavement formation. Eolian material is transported from the ground surface to pedogenesis of vesicular horizons interiors, thereby increasing the thickness of the vesicular horizon underlying desert pavements. In other words, desert pavement traps and binds dust. Through this action, soil horizons are created and the soil thickness increases.

The following descriptions of soil settings and soil types within the NCA are based on a soil survey of Washington County conducted between 1967 and 1971 by the USDA Soil Conservation Service (Mortensen 1977). Some vegetation communities, soil conditions, and land uses have changed measurably since this inventory was conducted over 50 years ago; however, this survey represents the best available information on soil resources in the NCA.

3.5.1 Soil Setting

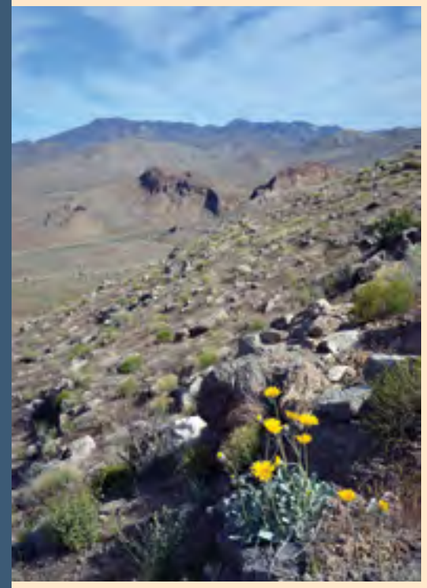
Nearly 30% of the NCA is comprised of miscellaneous land types, including Rock Land, Rough Broken Lands, and Riverwash. Soil interpretations, such as erosion hazard, are generally not provided for these miscellaneous land types; however, they can and do influence

"Desert pavements are prominent features in arid environments and consist of a surface layer of closely packed gravel that overlies a thin, gravel-poor soil horizon."

What Is Soil?

By definition soil is composed of both abiotic components, such as sand, silt, and clay from the weathering and erosion of geological sources; and biotic material—organic matter from the decay of plants, animals, and other organisms. (National Science Teachers Association 2014)

Photo 3-19 Rock Land, Beaver Dam Wash NCA



surrounding soils by affecting runoff patterns and surface water flows.

Rock Land (Photo 3-19) consists of 60 to 80% rock outcrop and 20 to 40% shallow soils over bedrock. Slopes are gently sloping to steep. The vegetation is mainly shrubs and forbs at lower elevations, and sparse pinyon pine and Utah juniper at intermediate elevations. Erosion is moderate, and the sediment production is low to medium, depending upon the amount and kind of vegetation.

Rough Broken Land is mainly found on the rugged landforms along the channel of the Beaver Dam Wash. The stream terraces are deeply dissected by narrow ephemeral drainages that convey runoff to the stream channel. The surface of this land type generally has a pavement of gravel, cobbles, and stones that covers 70 to 80% of the surface. Vegetative cover consists of creosote bush-bursage desert shrubs, as well as native and exotic grasses and forbs.

Riverwash consists of stratified, dominantly coarse-textured, gravelly, cobbly, or stony materials in the warm desert washes and narrow drainage ways of the

Photo 3-20 Cave Series Soils, Beaver Dam Wash NCA

NCA. The material varies considerably over a short distance and sheet washes during periods of high runoff. Sparse vegetation occurs on higher areas that have not been flooded for several years.

3.5.2 Soil Types

Soils are grouped based on the physical, chemical, and mechanical characteristics that contribute to watershed functions, such as soil productivity, salinity, and water and wind erosion potential. These groups are used to assess impacts on soils from various uses, to evaluate the potential for restoration of ecological sites, to set the parameters for watershed management, and to determine the benefits and prioritization of restoration projects.

Soil types in the NCA are variable, reflecting the interactions between topography, elevation, parent material, and time. Topography ranges from nearly level valley bottoms to vertical cliffs. Parent materials for soils include sedimentary rocks (e.g., limestone, mudstone, shale, gypsum, and sandstone), igneous rocks (e.g., rhyolite and dacite), and metamorphic rocks (e.g., gneiss). Many alluvial soils have formed from mixes of these various parent materials.

Soil scientists have mapped 10 dominant soil types in the NCA (Mortensen 1977) (Map 3-5). These are briefly described below.

The Cave Series (Photo 3-20) covers nearly two thirds of the NCA, at elevations between 2,400 to 4,200 feet ASL. These shallow, well-drained soils typically top a 10 to 20 inch deep carbonate-cemented hardpan. The parent materials are generally gravelly alluvium from limestone, dolomite, quartzite, gneiss, and shale. The Cave Series soils support Mojave Desert shrubs. Runoff is slow and the hazard of erosion is slight to moderate.

Approximately 1250 acres of the NCA are covered by Welring and Tortugas very gravelly loams. These soils are characterized by very steep slopes (20-70%) and are predominately weathered from limestone formations. Both of these soils are shallow with root restrictive layers or bedrock within 10 to 20 inches of the surface. Erosion hazard is moderate to high.

Photo 3-21 Renbac-Rock Land Association Soils, Beaver Dam Wash NCA

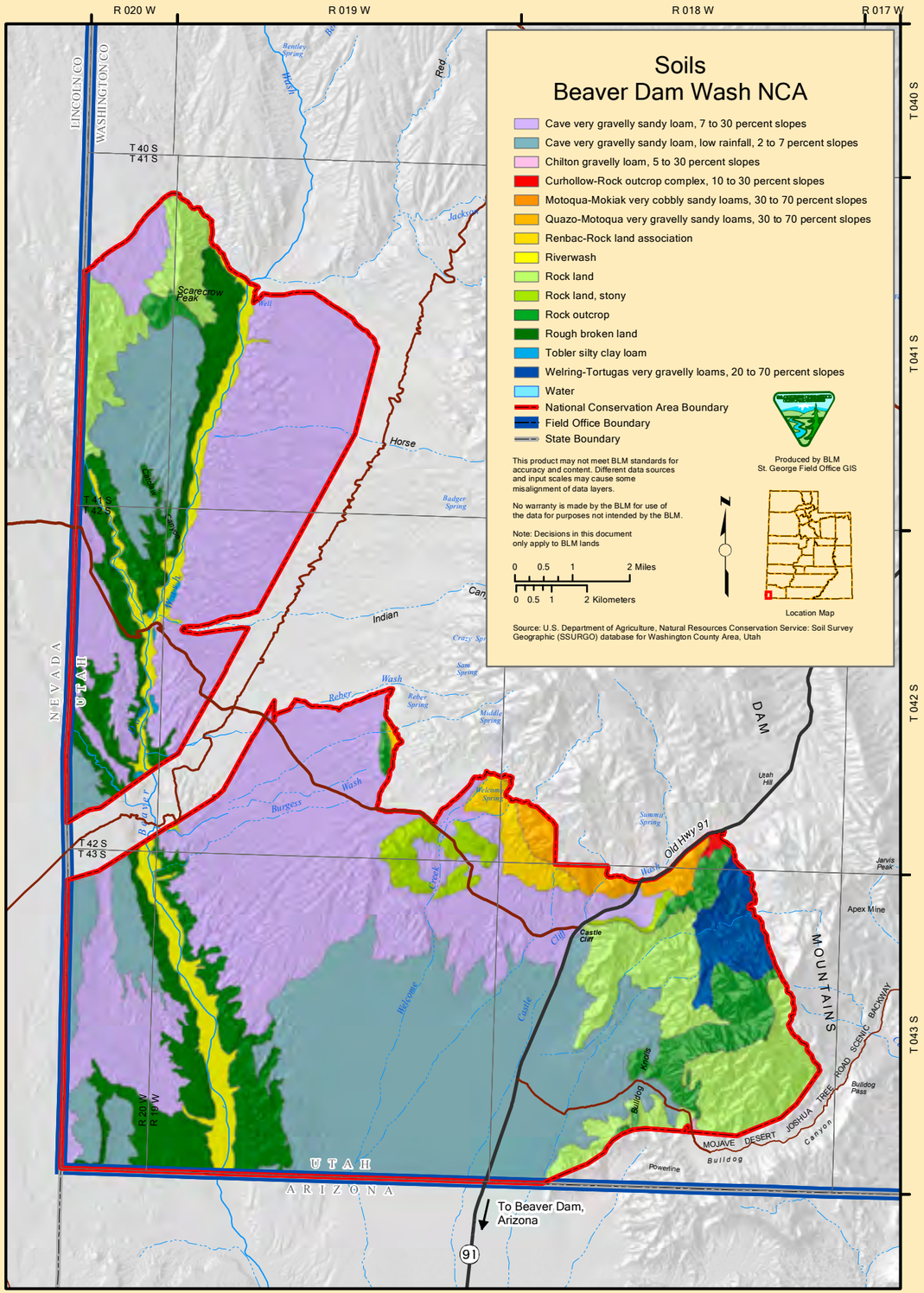
Quazo and Motoqua soils are intermingled on approximately 1000 acres of the NCA. They occur on landforms with steep slopes (30-70%), low organic matter, and shallow depths (8 to 20 inches), with the Motoqua being slightly shallower. Erosion hazard is high for both of these soil types. Volcanic rocks such as rhyolite, andesite, and dacite are the most common parent material for both soil types.

Renbac soils are found in combination with Rock Land and cover less than 900 acres of the NCA (Photo 3-21). They occur on landforms with 2-30% slopes and result from the weathering of sandstone, shale, and other sedimentary parent materials. These soils are low in organic matter, shallow (ranging from 8 to 17 inches in depth), and have a slight to moderate erosion hazard.

3.5.3 Sensitive and Fragile Soils

Sensitive and fragile soils are those identified as having characteristics that make them extremely susceptible to erosion or more difficult to reclaim after surface-disturbance events. Slope steepness also increases the erosion potential of these soils because it increases the rate at which water

"Soils are grouped based on the physical, chemical, and mechanical characteristics that contribute to watershed functions, such as soil productivity, salinity, and water and wind erosion potential."



will flow overland, transport soil particles, and create gullies and rills. Approximately 30% of the land base of the NCA is comprised of miscellaneous landforms that are characterized by steep slopes, sparse vegetation, rocky outcrops, and gravel beds. During precipitation events, runoff flows from these landforms can erode soils. Fine or coarse soil textures, shallow depths, water holding capacity, and the degree of landform slope all contribute to a soil's potential for erosion.

Because vegetative cover is sparse on most of these soils, soil particles may not be "anchored" in place and may easily be eroded by wind or water. As a result, storm events quickly erode rills and gullies on these landforms. In the NCA, approximately 2,000 acres would be rated as having a severe soil erosion hazard, approximately 30,000 acres would be evaluated as having a moderate erosion hazard, and approximately 20,000 acres would be considered to have a slight erosion hazard.

3.5.3.1 Biological Soil Crusts

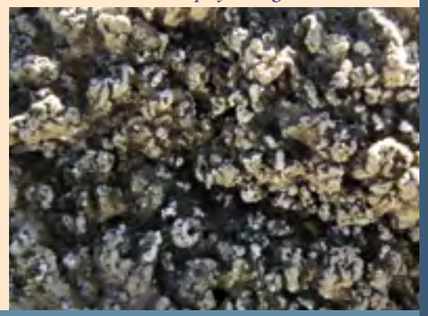
Biological soil crusts (also called cryptogamic or cryptobiotic soils) in arid regions like the Mojave Desert are composed primarily of cyanolichens and cyanobacteria (Photo 3-22). These crusts are important soil stabilizers or "living mulches" that retain soil moisture and discourage the growth of annual invasive weeds. Because plant cover is sparse, biological soil crusts are a critical source of organic matter for desert soils, and an important food source for organisms that live below the soil surface and help to keep nutrients available for plants by decomposing plant litter. Cyanolichens, cyanobacteria, and other living organisms in biological soil crusts are concentrated within the top 1/8 inch of the soil (Photo 3-23) and fix nitrogen in a form usable by plants, an especially important function in desert ecosystems where nitrogen often limits plant growth (Belnap 2002).

Crusts generally cover all soil spaces between plants, creating a continuous surface that may be very difficult to distinguish from bare ground. Immature crusts are generally flat and the same color as the soil, while mature crusts may have more surface texture and be a darker color due to the higher densities of cyanobacteria and other organisms.

Biological soil crusts can be indicators of ecological health, as well as indicators of physical disturbance. Repeated disturbance or trampling of biological crusts can permanently destroy the living filaments of the organisms, preventing the recovery of the crusts. Blowing dust from disturbed soils can cover nearby crusts, depriving them of needed sunlight, ultimately leading to the death of the living organisms that comprise the crusts. Without these crusts, soil fertility, stability, and moisture retention capacity can be lost. Restoration of biological crusts so that they can stabilize soil can take up to 250 years in arid lands, assuming that they are not again disturbed (Belnap 2002). Large areas of bare ground, rills,

Photo 3-22 Biological Soil Crust, Beaver Dam Wash NCA

Photo 3-23 Close-up of Biological Soil Crust



Don't Bust the Crust!

Biking and driving: Stay on established roads and trails. Do not skirt barriers or fences.

Camping: Use designated campsites. Otherwise establish camp in areas where living crusts do not form, such as slickrock, sandy areas, or under groves of trees.

Hiking: Stay on established trails. Where trails do not exist, hike in washes or on rocks.

Ecotone

An ecotone is a transitional area between different vegetation communities or regions where the species of each community or region integrate. Ecotones can occur on many scales and exhibit diverse patterns. The integration of species can cover large regional areas or occur within a small pocket, and can be evenly mixed or appear as a distinct line. (Encyclopedia Britannica 2014)

Photo 3-24 Mojave Desert Ecosystem Featuring Creosote Bush and White Bursage

or gullies are a few of the key indicators used in evaluating whether soil quality and function are being compromised.

3.6 NATIVE VEGETATION COMMUNITIES

3.6.1 Ecosystems

The NCA is within a transition zone (ecotone) between the Mojave Desert and Great Basin ecoregions. Ecotones are places where plants and animals characteristic of different ecoregions mix and interact, creating unique communities that are often species-rich. A number of ecosystems and ecotones, described in greater detail below, can be found within the boundaries of the NCA.

3.6.1.1 Mojave Desert Ecosystem

The Mojave Desert ecosystem covers approximately 35% (22,040 acres) of the NCA, at its lowest elevations (Photo 3-24). Creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) dominate, with bursage more prevalent in warmer and drier sites. Other common species include Mormon tea (*Ephedra nevadensis*), broom snakeweed (*Gutierrezia sarothrae*), blackbrush (*Coleogyne ramosissima*), rubber rabbitbrush (*Ericameria nauseosa*), and native grasses like big galleta (*Pleuraphis rigida*), and bush muhly (*Muhlenbergia porteri*). Creosote bush communities are typically very open and species-poor, with considerable amounts of bare ground. Grasses in this ecosystem are relatively rare while cacti (*Cactaceae*) are relatively common.

3.6.1.2 Mojave-Great Basin Ecotone

The Mojave-Great Basin ecotone contains vegetation-type representatives from both the Mojave Desert and Great Basin ecosystems (Photo 3-25). Soil and vegetation vary widely within the transition area, although it more closely resembles the Mojave Desert than the Great Basin. Annual precipitation ranges from 10 to 12 inches, with most occurring from November through April. Summers are hot and dry with many days reaching above 100° F. Blackbrush communities typically grow on alluvial fans and bajadas in this zone above the creosote bush communities and below the pinyon-juniper communities at higher elevations.

3.6.1.3 Big Sagebrush-Steppe Ecosystem

The Great Basin ecoregion includes species associated with a cold desert and an annual precipitation regime of 12-24 inches. A big sagebrush-steppe ecosystem covers much of this ecoregion, with

Photo 3-25 Mojave-Great Basin Ecotone Featuring Blackbrush

native grasses, forbs, and biological soil crusts filling interspaces.

3.6.2 NCA Vegetation Communities

Vegetation in the NCA is divided into the communities shown in Table 3-5.

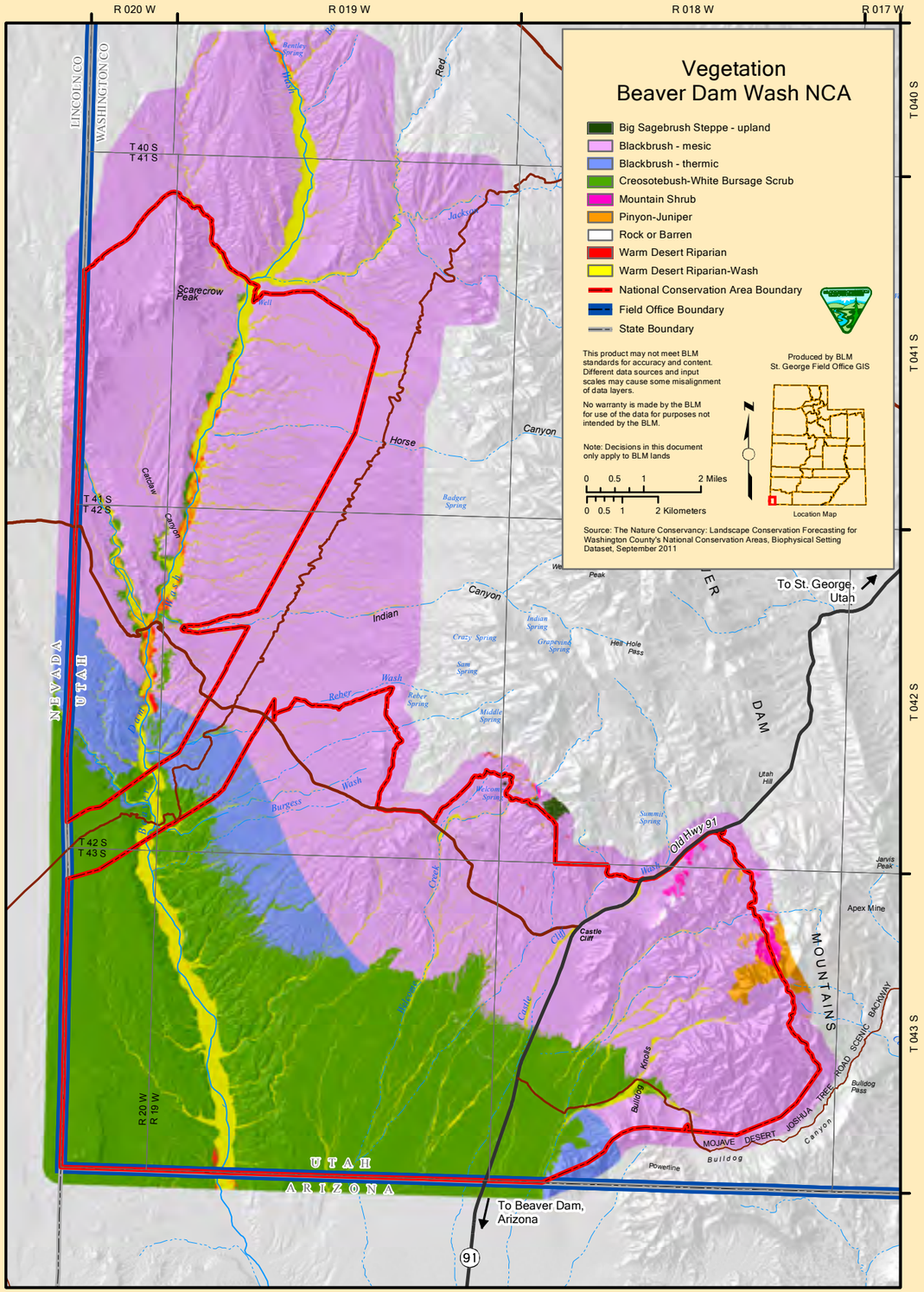
Map 3-6 shows the distribution of each vegetation community within the NCA. In 2011, a Landscape Conservation Forecasting process was completed for the NCA by The Nature Conservancy in partnership with BLM, UDWR, and USFWS. High resolution imagery, field studies, computer modeling, and collaboration among ecologists, biologists, and other resource specialists were employed to assess the current ecological health of the native vegetation communities within the NCA. For each vegetation community, the assessment developed a numerical ecological departure score that reflected the degree to which the communities of the NCA were "out of balance", or dissimilar to the reference-baseline or Natural Range of Variability (NRV). The ecological departure score reflected the dissimilarity between: (1) the amounts of specific vegetation classes expected to be present under reference (or pre-European settlement) conditions; and (2) the amounts of vegetation classes that are currently observed in the NCA. A majority of the ecological systems in the NCA had departure values at the maximum of 100%; that is, total dissimilarity from these systems' NRV. The primary cause of ecological departure was due to the nearly complete presence of invasive annual grasses (*Bromus* spp.) and exotic forbs in burned, re-burned, and unburned areas of the NCA (The Nature Conservancy 2011). Map 3-7 displays the percentages

Table 3-5 Vegetation Communities

Vegetation Community	Acres	Percent
Creosotebush-White Bursage Scrub	22,041	34.87%
Blackbrush (Mesic)	33,628	53.20%
Blackbrush (Thermic)	3,653	5.78%
Big Sagebrush Steppe (Upland)	14	0.022%
Pinyon-Juniper Woodland	270	0.43%
Mountain Mahogany	0.5	0.0008%
Mountain Shrub	143	0.23%
Warm Desert Riparian	114	0.18%
Warm Desert Riparian Wash	3,345	5.29%

"[Vegetation] communities are characterized by the gross structure, or life form, of the prominent species in a particular habitat."

–Renée Van Buren, Utah Valley University Faculty


Vegetation
Beaver Dam Wash NCA
Big Sagebrush Steppe - upland
Blackbrush - mesic
Blackbrush - thermic
Creosotebush-White Bursage Scrub
Mountain Shrub
Pinyon-Juniper
Rock or Barren
Warm Desert Riparian
Warm Desert Riparian-Wash
National Conservation Area Boundary
Field Office Boundary
State Boundary
This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.
Note: Decisions in this document only apply to BLM lands
Produced by BLM
St. George Field Office GIS
Location Map
0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
Source: The Nature Conservancy: Landscape Conservation Forecasting for Washington County's National Conservation Areas, Biophysical Setting Dataset, September 2011
R 020 W
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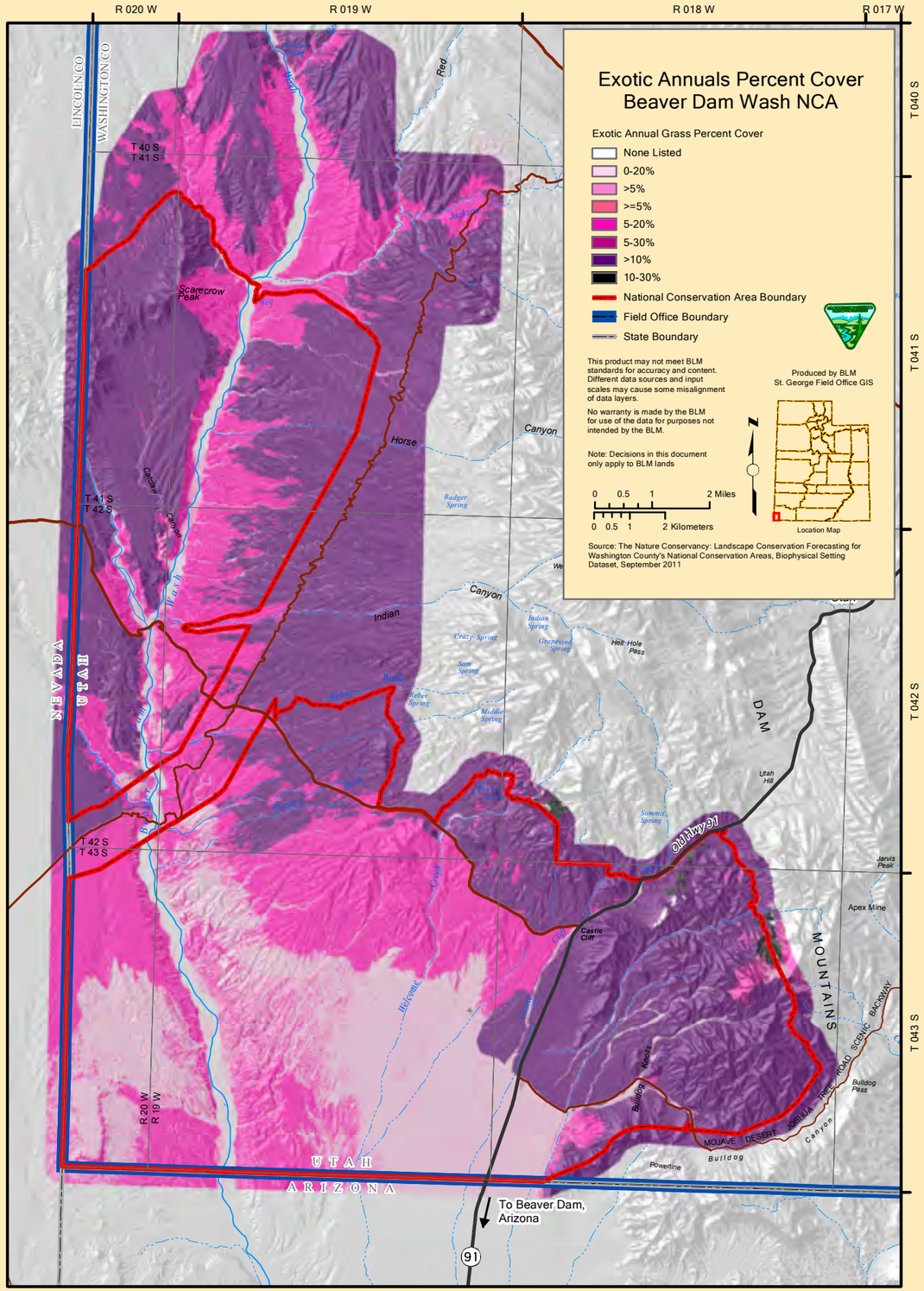
T 042 S
T 043 S
T 40 S
T 41 S
T 41 S
T 42 S
T 42 S
T 43 S
LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
Bentley Spring
High
Red
Jackson
Scarecrow Peak
Well
Caldow
Canyon
Horse
Canyon
Badger Spring
Indian
Canyon
Indian Spring
Crazy Spring
Grapevine Spring
Hell Hole Pass
Sam Spring
Reber
Wash
Reber Spring
Middle Spring
Dutch
Burgess
Wash
Welcome Spring
Summit Spring
Old Hwy 91
Utah Hill
DAM
Jarvis Peak
Apex Mine
Castle Cliff
Castle
Cliff
Knolls
Bulldog
Bulldog Pass
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
Canyon
Bulldog
Powerline
MOUNTAINS
To St. George, Utah
To Beaver Dam, Arizona
91


Exotic Annuals Percent Cover
Beaver Dam Wash NCA
Exotic Annual Grass Percent Cover
None Listed
0-20%
>5%
>=5%
5-20%
5-30%
>10%
10-30%
National Conservation Area Boundary
Field Office Boundary
State Boundary
This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.
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Source: The Nature Conservancy: Landscape Conservation Forecasting for Washington County's National Conservation Areas, Biophysical Setting Dataset, September 2011
R 020 W
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LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
Bentley Spring
High
Red
Jackson
Scarecrow Peak
Well
Caldow
Canyon
Horse
Canyon
Badger Spring
Indian
Canyon
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Grapevine Spring
Hell Hole Pass
Sam Spring
Reber
Wash
Reber Spring
Middle Spring
Dutch
Burgess
Wash
Welcome Spring
Summit Spring
Old Hwy 91
Utah Hill
DAM
Jarvis Peak
Apex Mine
Castle Cliff
Castle
Cliff
Knolls
Bulldog
Bulldog Pass
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
Canyon
Bulldog
Powerline
MOUNTAINS
To Beaver Dam, Arizona
91

"Sage-brush is a very fair fuel, but as a vegetable it is a distinguished failure. Nothing can abide the taste of it but the jackass and his illegitimate child the mule."
–Mark Twain, Author and Humorist, 1835-1910

of exotic invasive annual species by vegetation community within the NCA.

A Mesic Blackbrush community covers approximately 53% of the land base of NCA (Photo 3-26). The dominant shrubs are blackbrush, which can comprise 90-95% of the community, and Joshua trees (*Yucca brevifolia*). Codominant shrub species include Mormon tea, big rabbitbrush (*Chrysothamnus nauseosus*), spiny hopsage (*Grayia spinosa*), Anderson wolfberry (*Lycium andersonii*) and banana yucca (*Yucca baccata*). Utah juniper (*Juniperus osteosperma*) is often associated with mesic blackbrush at higher elevations. This community changes little over many decades, exhibiting very low reproductive rates and very slow growth. Currently the majority of this community has at least 10% or more of invasive brome grass species (e.g., cheatgrass (*Bromus tectorum*), red brome (*Bromus rubens*)), and filaree (*Erodium* spp.) composition and less than 10% blackbrush.

Joshua tree forests in this ecozone are at the northernmost extent of their range in Utah. The 1,042 acre Joshua Tree NNL is located entirely within the boundaries of the NCA. This exemplary Joshua tree forest was added to the national system of Natural Landmarks in 1966 by the NPS to acknowledge its importance in the natural resource heritage of this nation.

The Blackbrush-Joshua Tree community is one of the most flammable native plant assemblages in the Mojave Desert (Photo 3-27). The historical fire regime of this community was one of infrequent fire return intervals (averaging about 75 years between fires), with high variation of fire occurrence due to year-to-year variation of drying shrub foliage, shrub mortality, and forbs. This community will not re-establish as a mature community for hundreds of years after wildfires.

In the NCA, there are approximately 3,650 acres of thermic blackbrush growing mid-slope on the Beaver Dam Mountains. This community grows where precipitation is less than 10 inches annually; the dominant shrubs are blackbrush, white bursage, and Joshua trees. Utah juniper is never present in a thermic blackbrush community. This community has been substantially invaded by brome grasses and filaree.

The Creosotebush-White Bursage Scrub community covers 22,041 acres or 34.87% of the land base of the NCA (Photo 3-28). These desert shrubs grow at the lowest elevations and are typically found below the blackbrush zone on well-drained alluvial flats, at elevations ranging from 5,000-6,000 feet. Creosotebush and white bursage dominate, with bursage more prevalent in drier, warmer sites. Invasive brome grasses and other exotics are found throughout this community.

Sagebrush communities are the most widespread of the "typical" Great Basin plant communities. In the NCA, there are 14 acres of big sagebrush (*Artemisia tridentata*), found at elevations generally above 8,000 feet. Major shrubs include Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), blackbrush, shadscale (*Atriplex confertifolia*), and Mormon tea. Common associates include winterfat (*Eurotia lanata*), spiny hopsage, blue grama (*Bouteloua gracilis*), needle-and-thread (*Hesperostipa comata*), wild ryes (*Elymus* spp.), and Indian ricegrass (*Acnatherum hymenoides*).

A Pinyon-Juniper Woodland covers less than 0.4% of the NCA and is typically found between 5,500-8,000 feet ASL, often on steep, rocky slopes. The species of pinyon most often present is the single leaf pinyon (*Pinus monophylla*), while Utah juniper is the most common juniper present, with one-seed juniper (*Juniperus monosperma)* occasionally found. Utah juniper is a climax species in a number of pinyon-juniper, sagebrush (*Artemisia* spp.), grassland, and shrub-steppe communities.

Understory layers can include shrubs like cliffrose (*Purshia* spp.), Mormon tea, and

Photo 3-26 Mesic Blackbrush Community

Photo 3-27 Typical Fire Damaged Mesic Blackbrush Community

Photo 3-28 Creosote-White Bursage Scrub Community

"The Blackbrush-Joshua Tree community is one of the most flammable native plant assemblages in the Mojave Desert."

native grasses. Cheatgrass has invaded between 5 and 30% of this community, particularly in areas that have burned recently in wildfires. Grasses are the most common understory component. Predominant (or formerly predominant) grasses include grama (*Bouteloua* spp.), Arizona fescue (*Festuca arizonica*), prairie junegrass (*Koeleria macrantha*), Indian ricegrass, needlegrass (*Nasella* spp.), dropseed (*Sporobolus* spp.), and squirreltail (*Elymus elymoides*). Shrubs may include sagebrush, cliffrose, serviceberry (*Amelanchier* spp.), rabbitbrush (*Ericameria and Chrysothamnus* spp.), shadscale, and winterfat.

Understory plants are most common along the edges of the zone. Bare ground is very common. The natural fire regime of these pinyon-juniper areas ranges from frequent to infrequent fire return intervals of 30 to 100 years with mixed to local stand replacement fire severity.

The Mountain Shrub community covers only 143 acres in the NCA and is comprised of either Stansbury cliffrose (*Purshia mexicana*) or snowberry (*Symphoricarpos* spp.) as the dominant shrubs. The snowberry is usually dominant at higher elevations on moderate to steep slopes with deep mesic soils above 8,000 feet elevation. Other shrubs, grasses, and forb species can also be abundant (Photo 3-29). Cliffrose is generally found at lower elevations and often in the pinyon and juniper woodlands on moderate to steep slopes.

A Warm Desert Riparian community covers approximately 114 acres (0.18%) of the public lands of the NCA at elevations typically below 4,000 feet. Mesquite (*Prosopis* spp.) bosques are found at elevations lower than 3,600 feet along intermittent drainages. Dominant species are willows (*Salix gooddingii*), Fremont's cottonwood (*Populus fremontii*), and rushes (*Carex* spp.) and cattails (*Typha* spp.).

Approximately 3,345 acres of the Warm Desert Riparian Wash Community are present in the NCA, within deeply incised ephemeral drainages (Photo 3-30). Flash-flooding is the major disturbance in this

Photo 3-29 Bigtooth Maple in Mountain Shrub Community

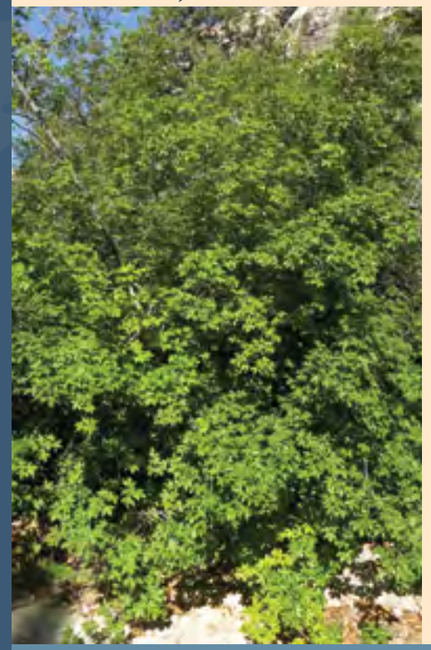


Photo 3-30 Warm Desert Riparian Wash Community

Bigtooth Maple

Acer grandidentatum is a beautiful maple with large, bright green, hand-sized leaves. Its red stems are striking as are the characteristic wing-like samaras (fruits borne in pairs).

community. Gravels and desert shrub species dominate, with shrub cover increasing over time between flood events.

A number of factors have influenced the ecological departure from NRV in native vegetation communities of the NCA. Livestock grazing affects the composition and production of native plant communities through selective foraging. It is generally agreed that present-day Mojave Desert communities did not evolve with significant selective grazing pressure from large-bodied herbivores (c.f., Beever et al. 2003, Grayson 1987) and desert vegetation is very slow to recover if overgrazed (Chambers 2013, Abella et al. 2007).

Surface disturbances, such as those created by utility line construction or cross-country travel by motorized vehicles, can damage native plants and biological soil crusts. Soil compaction resulting from surface disturbances inhibits water infiltration and impedes the re-establishment of native plants. Abella (2010) estimates that without active restoration, it can take 215 years for perennial and annual plant cover to re-establish in the Mojave Desert after surface disturbances.

3.7 FIRE AND FUELS MANAGEMENT

3.7.1 Natural Fire Regime

A natural fire regime is a general classification of the role that fire would play across a landscape in the absence of modern human-caused changes, such as mechanical treatments or the introduction of non-native species. Natural or historical fire regimes have been divided into five classifications based on the average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant over-story vegetation.

Large-scale or frequent wildland fires were not part of the natural fire regime of the Mojave Desert, as desert shrublands are not fire-adapted species (Paysen et al. 2000). Historically, wildfire was a rare occurrence because Mojave Desert ecozones did not produce enough vegetation to "carry" a fire, species like creosote bush were naturally fire-resistant, and the gaps between the shrubs impeded the spread of fires. Invasive annual brome grasses today fill in the gaps between the desert shrubs, creating a continuous and highly flammable fine fuel source that has completely altered the intensity and fire return intervals in the Mojave Desert.

Brome grasses are believed to have first been introduced to the Mojave Desert as early in the 18th century, with the establishment of the Spanish missions in California and the introduction of domestic livestock. After 1828, large herds of cattle, horses, and sheep were driven annually from southern California to Santa Fe, New Mexico through southwestern Utah on the Old Spanish Trail. This initial herding of domestic livestock through the region very likely introduced the brome grasses to southwestern Utah. Subsequent overgrazing of public rangelands by domestic cattle, sheep, and

"Fire regimes can be strong forces in the evolution of species traits. When fire regimes are rapidly altered, individual species and species assemblages may be significantly affected." (Brooks n.d.)

"One way invasions can affect native ecosystems is by changing fuel properties, which then affect fire behavior, and can ultimately alter fire regime characteristics such as frequency, intensity, extent, type, and seasonality of fire. If changes in fire regime subsequently promote the dominance of the invaders, then an invasive plant/fire regime cycle can be established." (USGS 2004)

horses in the late 19th and early 20th centuries contributed to their spread.

By the early decades of the 20th century, invasive annual grasses were already widespread in today's NCA. Woodbury and Hardy (1948, 171) noted that "the ever-present annual cheatgrass" was the most abundant annual that they encountered during their tortoise research on the Beaver Dam Slope in the 1930s. Today, the invasive grasses are even more prevalent and profoundly influence the wildfire cycle. When above-average precipitation has stimulated annual plant growth, the potential for large-scale fires to occur is ever-present as temperatures rise and the grasses cure. Fire size, frequency, and intensity has increased throughout the Mojave Desert—in 2005 alone, wildfires consumed 2.5% of the entire land area of the Mojave Desert and 26% of the designated critical habitat of the Beaver Dam Slope Sub-unit of the Northeastern Mojave Recovery Unit (Engel and Abella 2011).

Fire in desert shrublands is generally viewed as detrimental because it may take decades or centuries for the native vegetation to recover. Some native species re-sprout after fire, but blackbrush, Joshua trees, cacti and other Mojave Desert species are generally slow to recover or re-establish after fire, and recurrent fires can prevent their re-establishment (Brown and Minnich 1986). Many Mojave Desert shrubs are very slow-growing as a result of adaptations made to survive long drought periods. Their drought-tolerant features and high dead-to-live woody material ratio make them particularly vulnerable to fire. Invasive annual grasses, however, benefit from wildfires, re-spouting quickly and colonizing areas where native species have been lost. Many ecologists believe that invasive species are the primary threat to the persistence of ecosystems in the Mojave Desert (Abella et al. 2011).

3.7.2 Fire Regime Condition Classes

Fires are typically categorized on the basis of condition class, occurrence, size class, and regime. The fire season for Washington County is usually mid-May to mid-October. The most critical fire conditions correspond with the hot summer period that is characterized by low relative humidity, "dry-lightening" events, and thunderstorms.

The fire regime condition classes (FRCCs) reflect the frequency and severity of burns. Historically, the most prolific fire spread events have been wind-driven, especially in the brush plant cover types associated with annual invasive grasses. Plume-dominated fires have occurred particularly during very dry years in the mountain shrub vegetation type and in the older stands of pinyon-juniper. Table 3-6 defines the condition classes in terms of the relative risk of losing one or more key components that define an ecological system, based on five ecosystem attributes: disturbance regimes (patterns and frequency of insect, disease, fire), disturbance agents, smoke production, hydrologic function (sedimentation, stream flow), and vegetation attributes (composition, structure, and resilience to disturbance agents). A 2004 evaluation rated a majority of the NCA as being FRCC 3; this evaluation has not been updated to reflect current conditions and the impacts of the recent large fires.

3.7.3 Fire Occurrence

Map 3-8 and Map 3-9 depict fire occurrences in the NCA between 1993 and 2012. As these maps show, wildland fires have burned approximately 50% of the NCA and consumed nearly 80% of the blackbrush-Joshua tree community. Table 3-7 provides additional data on fire occurrence.

Prior to 2000, wildfires were typically less than 100 acres in size and the fire return interval low. During the period between 2000 and 2009, an average of 1.7 fires occurred each year and consumed an average of 3,530 acres annually. This average is skewed by the large fires in 2005 and 2006 that were fueled by dense stands of invasive grasses that sprouted after above-average fall and winter precipitation. Approximately 34,200 acres of the NCA were burned or re-burned in 14 fires. Fire frequencies have departed from historic frequencies by multiple return intervals, vegetation attributes have been significantly altered from the historical range, and the risk of losing key ecosystem components is high.

Table 3-6 Fire Regime Condition Class Definitions

Condition Class	Fire Regime Example Management Options
Condition Class 1	Fire regimes are within a historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within a historical range. Where appropriate, these areas can be maintained within the historical fire regime by treatments such as fire use.
Condition Class 2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range. Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.
Condition Class 3	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity, and severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range. Where appropriate, these areas may need high levels of restoration treatments, such as hand or mechanical treatments, before fire can be used to restore the historical fire regime.

Table 3-7 Fire Occurrence Data

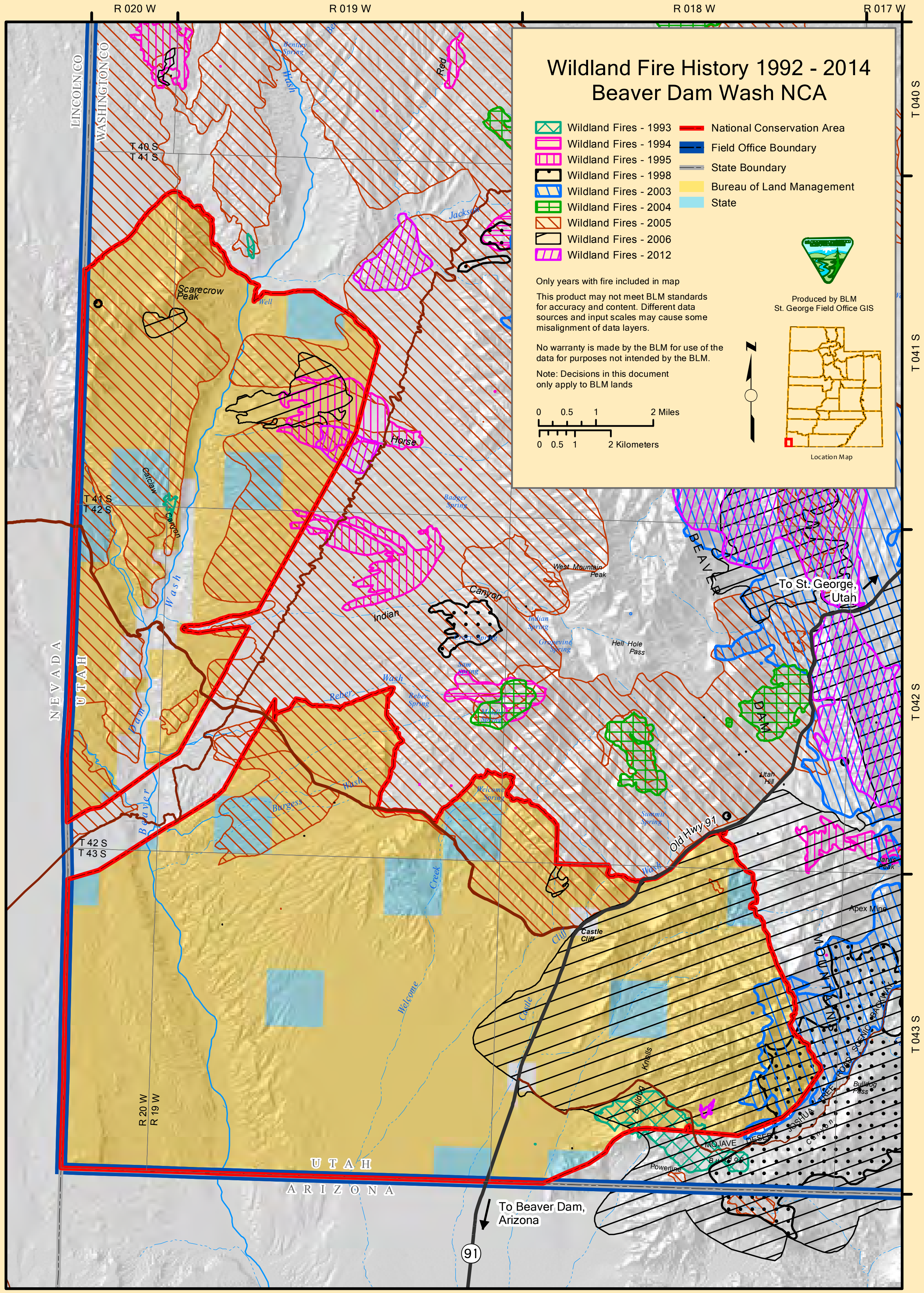
Year	Number of Fire Starts	Acreage* burned
2000	1	96
2001	1	0.1
2002	0	0
2003	3	1,094
2004	1	0.1
2005	7	20,664
2006	8	13,406
2007	1	0.5
2008	0	0
2009	1	1
2010	0	0
2011	1	0.9
2012	3	365
2013	0	0
2014	0	0

*Acreage is counted individually for each fire. Acres that burned more than once in these years are therefore counted multiple times.

3.7.4 Wildland Fire Suppression

Currently, all fires within the NCA are targeted for full suppression based on goals for the specific fire management unit and recommendations developed by the Desert Tortoise Management Oversight Group (MOG), an interagency and interstate working group that provides recommendations related to actions that will assist the recovery and delisting of the threatened Mojave desert tortoise.

"Currently, all fires within the Beaver Dam Wash NCA are targeted for full suppression."


Wildland Fire History 1992 - 2014
Beaver Dam Wash NCA
Wildland Fires - 1993
Wildland Fires - 1994
Wildland Fires - 1995
Wildland Fires - 1998
Wildland Fires - 2003
Wildland Fires - 2004
Wildland Fires - 2005
Wildland Fires - 2006
Wildland Fires - 2012
National Conservation Area
Field Office Boundary
State Boundary
Bureau of Land Management
State
Only years with fire included in map
This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.
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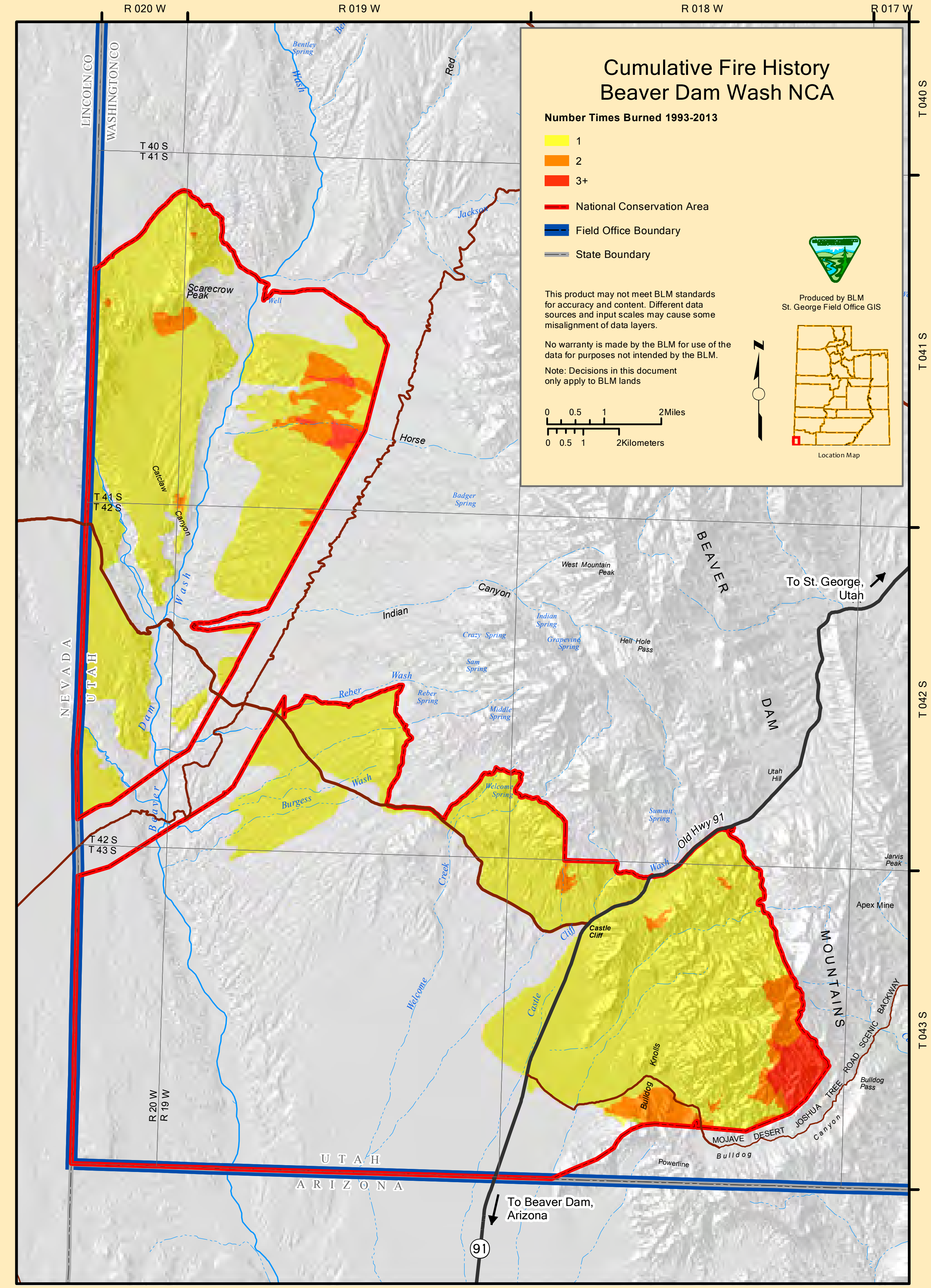
Note: Decisions in this document only apply to BLM lands
Produced by BLM St. George Field Office GIS
Location Map
0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
R 020 W
R 019 W
R 018 W
R 017 W
T 040 S
T 041 S
T 042 S
T 043 S
LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
BEAVER
DAM
Scarecrow Peak
Horse
Indian
Canyon
To St. George, Utah
To Beaver Dam, Arizona
Old Hwy 91
Castle Cliff
Apex Mine
91


Cumulative Fire History
Beaver Dam Wash NCA
Number Times Burned 1993-2013
1
2
3+
National Conservation Area
Field Office Boundary
State Boundary
This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.
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Produced by BLM St. George Field Office GIS
Location Map
0 0.5 1 2Miles
0 0.5 1 2Kilometers
R 020 W
R 019 W
R 018 W
R 017 W
T 040 S
T 041 S
T 042 S
T 043 S
LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
BEAVER
DAM
MOUNTAINS
Scarecrow Peak
Horse
Indian
Canyon
To St. George, Utah
To Beaver Dam, Arizona
Old Hwy 91
Castle Cliff
Apex Mine
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
91

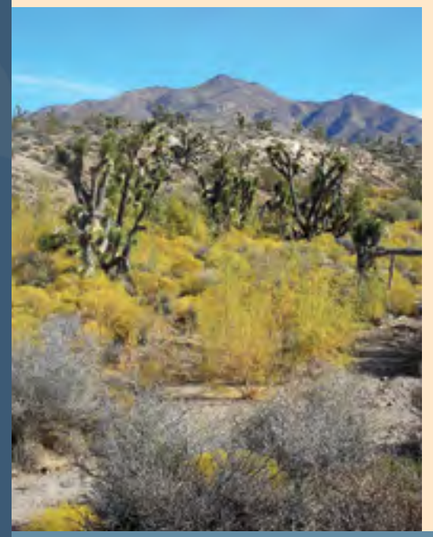
Saltcedar

Tamerix ramosissima was brought into the eastern United States as an ornamental shrub in the 1800s. In 1823, saltcedar was available for sale in New York. By 1870, it was listed for sale in California, having completed its journey across the states. The U.S. Department of Agricultural released saltcedar for general cultivation in 1870 to serve as windbreaks, shade, fuelwood, and ornamentals.

Prior to 2005, the MOG recommended that fires in tortoise habitat be fought using Minimum Impact Suppression Tactics (MIST), aerial fire fighting methods, and back burning (a.k.a. "burnouts" and "blacklines") to control fires with as little ground disturbance as possible.

During the 2005 and 2006 fire seasons, many acres of tortoise habitat were damaged or lost not only to wildfires but also to back burning operations during fire suppression. While back burning helped to quickly control fires, it also caused potentially unnecessary and permanent loss of habitat since desert shrubs do not recover quickly from single fire episodes and may never recover from multiple burns. After 2006, the MOG issued new guidelines for fire fighting in desert tortoise habitat, recommending that full and immediate suppression tactics be used in an effort to contain fires to the smallest possible size. The use of mechanical equipment, such as bulldozers to create fire breaks and off-road travel by engines, were evaluated as being less impacting than back burning if there are no other alternatives for containing any given fire to a small size. Map 3-10 displays the current fire management response for the NCA.

Photo 3-31 Saltcedar in Wash within Beaver Dam Wash NCA



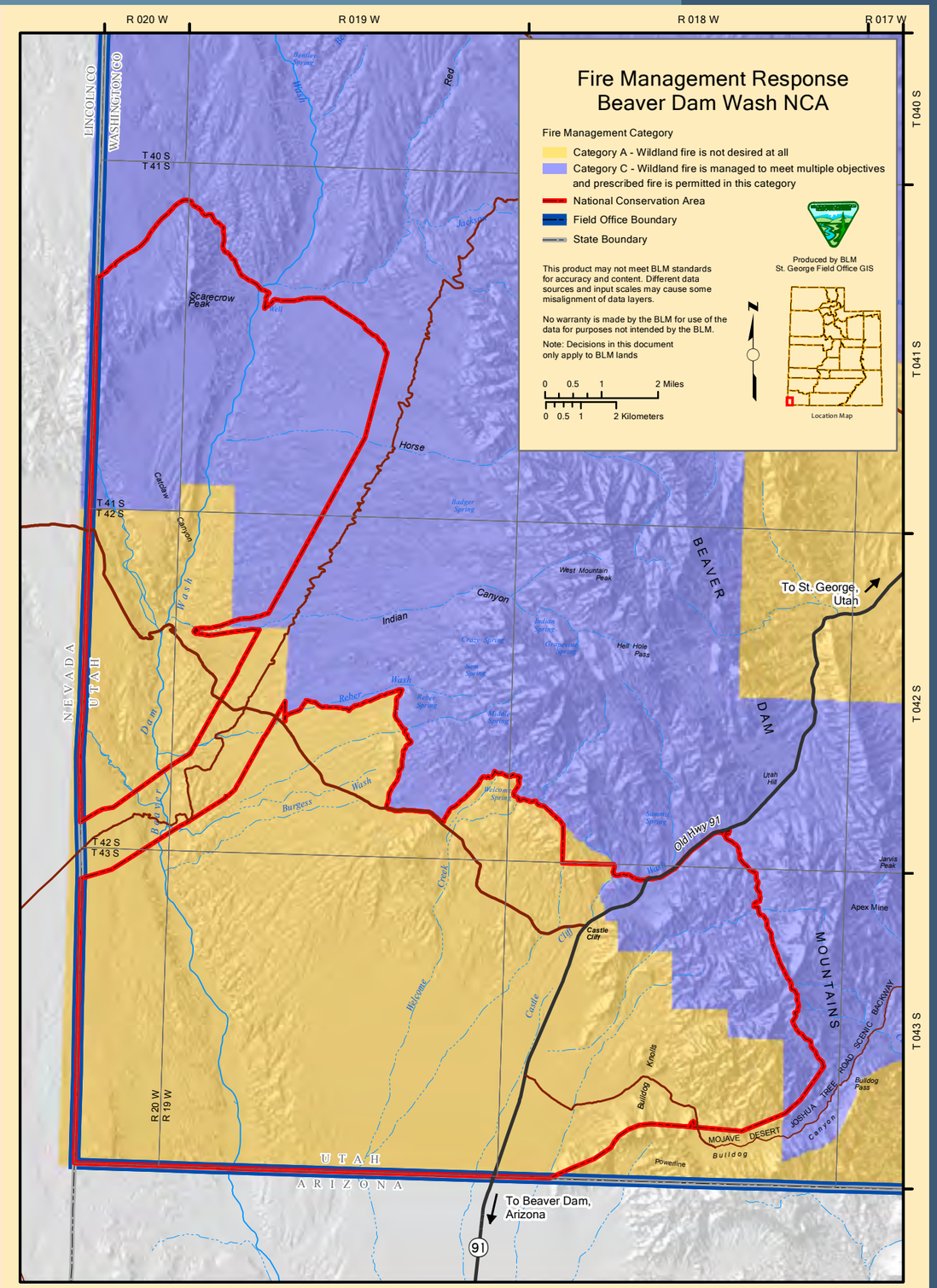
3.8 NOXIOUS WEEDS AND INVASIVE SPECIES MANAGEMENT

The presence of noxious weeds and invasive species can be used as indicators of healthy ecosystems as their presence is often related to disturbances and loss of native species in those systems. The State of Utah has categorized noxious weeds into three classes—Class A: Early Detection Rapid Response (EDRR), Class B: Control, and Class C: Containment. The State of Utah and Washington County have also listed the following species, found in many areas of the county, as noxious weeds:

- Scotch Thistle (*Onopordum acanthium*)
- Perennial Pepperweed (*Lepidium latifolium*)
- Hoary Cress (*Cardaria draba*)
- Silverleaf Nightshade (*Solanum elaegnifolium*)
- Yellow Starthistle (*Centaurea solstitialis*)
- Russian Knapweed (*Centaurea repens*)
- Poison Milkweed (*Asclepias subverticillata*)
- Bindweed (*Convolvulus arvensis*)
- Saltcedar (*Tamarix ramosissima*)

Although the entire land base of the NCA has not yet been systematically inventoried for the presence of noxious weeds, Scotch thistle and saltcedar are known to occur in the NCA. Scotch thistle is designated as a Class B: Control species that poses a threat to native vegetation and should be considered a high priority for control. The identified Scotch thistle infestation in the NCA is approximately 0.5 acre in size and has been actively treated by BLM to control its spread.

Saltcedar (Photo 3-31) is designated as a Class C: Containment species that is not native to the state of Utah and is widespread. Containment focus is on preventing expansion of the infestations.



"Well, it's a little odd, the path I took, because when I was young, I wanted to be a cattle rancher. That was what I knew and that was what I liked."

–Sandra Day O'Connor, Former Associate Justice of the Supreme Court of the United States, 1930–

Scattered infestations of saltcedar can be found near springs and riparian areas within the NCA.

Invasive species that are widespread in the NCA, and elsewhere in Washington County, include the annual brome grasses (red brome and downy brome, commonly called cheatgrass) and filaree. As described above under section 3.7, the invasive brome grasses were well established by the 1930s, as a result of overgrazing of the public rangelands, drought, fires, and dispersal of seeds by wind, wildlife, vehicles, and other human-related activities. Map 3-7 displays the percent cover of exotic annuals within the NCA.

3.9 VEGETATION RESOURCE USES: LIVESTOCK GRAZING

3.9.1 Livestock Grazing Management

Domestic sheep, cattle, and horses have grazed the public rangelands on the Beaver Dam Slope since the mid-19th century. The public rangelands were treated as a "commons"; the first stockman to move onto the range each season secured the use of new forage growth. Some sheep herders regularly trailed their herds from one area of forage and water to another throughout the year. Herders who followed this practice were called "tramp" operators in the 1930s and they continued to move their flocks to the most productive areas, creating conflicts with cattlemen who also relied on public rangelands for their herds.

Congress passed the Taylor Grazing Act in 1934 to bring order to the use of public rangelands and prevent further soil and vegetation loss to overgrazing. The Department of the Interior established the Grazing Service to implement the provisions of the Taylor Grazing Act and oversee the creation of grazing districts and the equitable allocation of forage on public rangeland to qualified grazing users (who held either base property or water rights to augment the public range in their grazing operations). During this same period, the Civilian Conservation Corps (CCC) assisted the Grazing Service to develop stock drives, fenced pastures, water reservoirs, and other range improvements intended to benefit stockmen and lessen the impacts of grazing on the public rangelands (Photo 3-32).

The establishment of grazing districts and allocations of allotments to qualified individual operators was a slow and

Photo 3-32 Zella Tank Corral, Beaver Dam Slope Allotment, Beaver Dam Wash NCA

contentious process. As late as 1941, 31 stockmen continued to graze 30,000 sheep, 5,000 cattle, and 300 horses on the Beaver Dam Slope (Grazing Service Files, CCC projects-1941). Yearlong grazing continued even after BLM was established as a new agency by Congress in 1949 (integrating the Grazing Service with the General Land Office) to oversee the administration of grazing districts and other public lands.

By the late 20th century, the public rangelands and riparian areas of the Beaver Dam Slope and other areas of Washington County were still in generally "poor condition" and required "the adjustment of livestock grazing to the capability of the range to produce forage on a sustained yield basis" (BLM 1978). Overgrazing by domestic cattle and sheep was implicated as a factor that allowed the brome grasses to become the dominant annuals in the Mojave Desert ecosystem and contributed substantially to the reduction and loss of native perennial grasses in the desert (USFWS 1994).

In 1974, a number of conservation groups filed suit in federal court, demanding that BLM take actions to remediate poor range conditions on approximately half of the public rangelands in Washington County, Utah, and in some areas of the Arizona Strip. The agency's response to this litigation was to prepare the Hot Desert Grazing Management Environmental Statement (1978) in which new grazing systems and reduced stocking rates were proposed to lessen the impacts of grazing on public rangeland.

In 1980, USFWS initially listed the population of desert tortoises on the Beaver Dam Slope as an endangered species and designated critical habitat for this species. The new grazing systems for allotments within desert tortoise habitat had to ensure that adequate annual forage would be available for the desert tortoise in spring, especially during low rainfall years, and to allow perennial native grasses preferred by tortoises, such as bush muhly and Indian ricegrass, to increase in cover and vigor. Allotment Management Plans (AMPs) were prepared in the 1980s for the allotments on the Beaver Dam Slope to describe the desired future resource conditions and manner of grazing use that would achieve these goals.

In 1999, the SGFO RMP administratively designated the Beaver Dam Slope ACEC,

Photo 3-33 Stock Tank in Castle Cliffs Allotment, Beaver Dam Wash NCA

"There's nothing like sitting back and talking to your cows."

–Russell Crowe, Actor, 1964–

"Never kick a cow chip on a hot day."
–Anonymous

to implement management recommendations from the *Mojave Desert Tortoise Recovery Plan* (USFWS 1994). The 48,590 acre ACEC encompassed a majority of the designated critical tortoise habitat in the Northeastern Mojave Recovery Unit of Utah and proposed management direction to assist the recovery and delisting of desert tortoise. The RMP did not close the ACEC to livestock grazing, as was recommended in the recovery plan; instead, livestock grazing within designated critical habitat in the ACEC was seasonally restricted to the period when tortoises are not active (between November 1 and March 15). This seasonal restriction lessened potential competition between tortoises and cattle for spring forage and reduced the threat that juvenile tortoises and occupied shallow dens might be trampled by livestock.

3.9.2 NCA Grazing Allotments

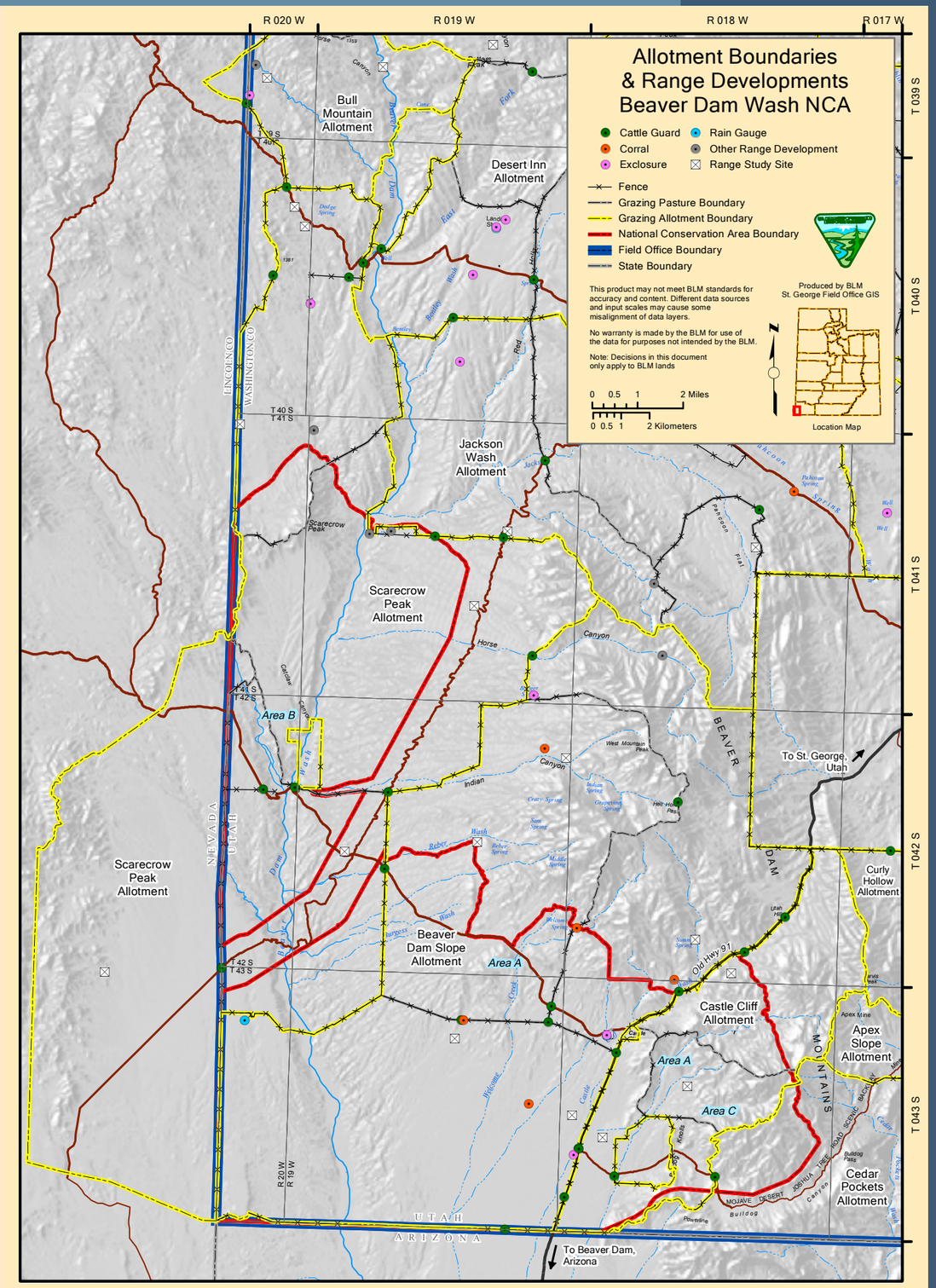
The NCA includes portions of four grazing allotments: Beaver Dam Slope, Scarecrow Peak, Castle Cliffs, and Cedar Pockets (Map 3-11). Table 3-8 and Table 3-9 provide additional data, including acreage, seasons of use, and permitted grazing use for these allotments. Livestock grazing on the Cedar Pockets allotment is administered by BLM's Arizona Strip Field Office. Twelve livestock operators are licensed to graze the four allotments, with various levels of permitted use.

Table 3-8 Seasons of Use and Permitted Grazing Use

Allotment Name	Number of Cattle per Operator	Season of Use (Total)	Active Federal AUMs	Percent Public Land
Beaver Dam Slope	128	11/01 to 05/31	830	93
	38	11/01 to 05/31	244	92
	147	11/01 to 05/31	933	91
	78	11/01 to 05/31	489	90
	33	11/01 to 05/31	209	91
Scarecrow Peak	286	11/01 to 05/31	1,820	91
	331	11/01 to 05/31	2,215	96
	18	11/01 to 05/31	120	96
	51	11/01 to 05/31	348	98
	12	11/01 to 05/31	77	92
Castle Cliffs	88	11/16 to 05/31	514	90
Cedar Pockets	50	10/16 to 05/31	375	100
Note: These allotment numbers reflect the entire allotment. Allotments have area both inside and outside the NCA.				

Table 3-9 Allotment Acreage and Land Status

Allotment Name	Acres in NCA				Total Acres in Allotment				
	BLM	State	Private	Total	BLM	State	Private	USFS	Total
Beaver Dam Slope	30,470	2,282	207	32,959	54,950	6,085	207	-	61,242
Castle Cliffs	8,310	1,156	116	9,582	11,863	2,188	480	-	14,531
Scarecrow Peak	21,131	3,003	1,288	25,422	71,451	5,488	1,665	165	78,769
Cedar Pockets	2,066	-	-	2,066	9427	102	38	-	9567



"The Beaver Dam Slope, Castle Cliffs, and Scarecrow Peak Allotments are managed as Category I ("Intensive" management) allotments."

The Beaver Dam Slope, Castle Cliffs, and Scarecrow Peak Allotments are managed as Category I ("Intensive" management) allotments. Category I allotments are defined as having the potential for intensive livestock grazing management systems, high forage values, or the majority of land under public ownership. This allotment category may also be labeled "Improve" allotments, meaning that these allotments have management and resource concerns and, therefore, receive priority for range project implementation and monitoring by BLM. The Cedar Pockets Allotment is managed as a Category M (Maintain) allotment, requiring a less intense level of livestock management.

3.9.2.1 Beaver Dam Slope Allotment

Approximately 33,000 acres of the approximately 61,200 acre Beaver Dam Slope Allotment (Photo 3-34) are located in the western portion of the NCA. Old Highway 91 forms the eastern boundary of the allotment, and the Arizona and Nevada state lines bound it to the south and west, respectively (Map 3-11).

The allotment is currently divided into three pastures and operates under a rest-rotation grazing system. The 10 year federal grazing permits authorize 424 cattle to graze the allotment from November 1 to May 31 (except within the ACEC, where livestock must be removed by March 15), grazing the Beaver Dam Slope Pasture in winter, and Santa Clara Slope and Indian Springs Pastures in spring. Permitted use continues to be 2,709 active AUMs and 257 exchange of use AUMs. In recent years, actual use in the Beaver Dam Slope Allotment has been less than the permitted use due to drought, wildfire, and re-vegetation efforts following wildfires. Average use over the last decade was 1,463 AUMs or approximately 54% of permitted use. There were no years where actual use exceeded permitted use, and the highest use occurred in 1998-1999 when use totaled 2,058 AUMs. (Refer to Appendix J for a table displaying actual use for all NCA allotments).

An AMP was developed in the early 1980s and finalized in 1987. It identified the grazing management system to be followed and key species to be monitored, including species that were palatable to livestock as well as those that were beneficial for desert tortoise. Over time, and as a consequence of drought, wildfires, and other factors, those species identified as being beneficial for tortoises, particularly the perennial grass bush muhly, have disappeared from the study plot areas. The AMP needs to be revised to reflect the changed conditions of the vegetation communities on the Beaver Dam Slope.

Photo 3-34 Livestock in Beaver Dam Slope Allotment, Beaver Dam Wash NCA

Frequency and cover are the two biotic components used for monitoring long-term trend in the allotments. Cover data is collected using the point intercept method and frequency data is collected using the nested plot frequency method. Updated long-term trend methods were implemented in 2012 to remain consistent with the *BLM H-4400-1Utah Monitoring Manual for Upland Rangelands* and to have uniformity of methodology throughout all the BLM offices in the state. Updated methods implemented include using larger quadrat sizes in the nested plot frame and also recording two additional cover points per quadrat.

Cover and frequency data are used to determine the nature of potential change at a study plot. Recent species frequency data were not included in the tables below due to the change in monitoring methodology. As a result of this change, the nested plot frequency data collected in 2012 and 2013 became the new "baseline data" for comparative purposes as it relates to future monitoring. The new baseline data could not be compared to the nested frequency data that had been collected by BLM in past as the methodologies were different.

Historical frequency data collected for the Beaver Dam Slope Allotment appeared to show relatively stable trends, though 2008 trend studies showed a decrease in live cover of key plant species and an increase in bare ground cover as a result of recent wildfires that have damaged much of the allotment. These wildfires have made vegetation conditions difficult to evaluate as four of the six historical study site plots were burned. Data from the two unburned sites are shown below in Table 3-10 and Table 3-11.

"I don't want any vegetables, thank you. I paid for the cow to eat them for me."
–Douglas Copeland, Author, 1961–

Table 3-10 Frequency Data from Study Site #6 Santa Clara Slope Pasture

Percent Cover	1984	1989	1992	1996	2008
Bare Ground	23	43	26	34	42
Litter	24	22	40	38	37
Small Rock	24	31	40	25	19
Large Rock	1	2	2	1	1
Percent Species Frequency	1984	1989	1992	1996	2008
Creosote Bush (*Larrea tridentata*)	17	15	14	12	6
Blackbrush (*Coleogyne ramosissima*)	42	30	37	33	33
Mormon Tea (*Ephedra nevadensis*)	3	3	5	5	4
Turpentine Bush (*Ericameria laricifolia*)	8	11	8	10	1
Prickly Pear Species (*Opuntia* spp.)	12	7	13	16	13

Table 3-11 Frequency Data from Study Site #1 Beaver Dam Slope Pasture

Percent Cover	1989	1992	1996	2008
Bare Ground	35	32	13	19
Litter	14	14	22	22
Small Rock	40	44	38	46
Large Rock	6	7	5	3
Percent Species Frequency	1989	1992	1996	2008
Creosote Bush (*Larrea tridentata*)	7	7	7	8
Blackbrush (*Coleogyne ramosissima*)	54	51	59	55
Mormon Tea (*Ephedra nevadensis*)	3	4	6	5

Vegetation cover is measured using two techniques; foliar canopy cover and basal cover. Foliar canopy cover measurements can be inconsistent due to several variables including the phenology of plant species and season of sampling, while basal cover is less responsive to these variations in growth rates. For this reason, basal canopy is used in conjunction with foliar canopy cover of shrubs and trees to estimate the percent cover by each species and the species composition based on related cover values. Table 3-12 through Table 3-15 show data recorded in 2012 from all trend sites in this allotment located within the NCA.

3.9.2.2 Castle Cliffs Allotment

The Castle Cliffs Allotment is located approximately 18 miles west of St. George and lies southwest of the Beaver Dam Mountains (Map 3-11). It is comprised of approximately 14,531 acres, of which approximately 11,863 acres are BLM-administered, 2,188 acres are owned by the State of Utah, and 480 acres are private. An AMP (1989) identifies a grazing management system in which use occurs in four pastures, the Black Warrior, Desert, Bulldog, and Summit Pastures, under a modified deferred rest rotation system. The current 10 year grazing permit authorizes up to 514 federal AUMs and 88 total cattle to graze the allotment from November 16 to May 31 (except within the Beaver Dam Slope ACEC where livestock must be removed after March 15). Under the existing AMP, utilization of key species must not exceed 60% of annual growth.

This allotment contains the Woodbury Desert Study Area, which overlaps a portion of the Joshua Tree NNL. The Woodbury Desert Study Area was fenced in the 1980s to serve as a vegetation study plot, which allows comparisons to be made between grazed and ungrazed vegetation communities in this allotment. In 2006, a large wildfire damaged or destroyed much native vegetation in the Woodbury Desert Study Area.

A majority of the acreage of the Castle Cliffs Allotment has been burned and re-burned by wildfires over the last two decades (Photo 3-35). Areas within the allotment above 4,000 feet elevation were aerially seeded with native and non-native species (e.g., forage kochia (*Bassia prostata*)) with moderate to poor re-vegetation success. Areas within the allotment below 4,000 feet elevation were not seeded, and natural regeneration of native shrubs has progressed slowly, if at all; invasive annual grasses are widespread.

"A majority of the acreage of the Castle Cliffs Allotment has been burned and re-burned by wildfires over the last two decades."

Photo 3-35 Fire Damaged Castle Cliffs Allotment, Beaver Dam Wash NCA

With 514 AUMs allotted for grazing use in the Castle Cliffs Allotment, average use over the last decade was 373 AUMs, or approximately 73% of permitted use, due to drought, wildfires, and vegetation treatment efforts. There were no years where actual use exceeded permitted use, and the highest season of use was 1998-1999 when the permittees used 431 AUMs (refer to Appendix J for actual

Table 3-12 Data from Beaver Dam Slope Pasture East

Percent Cover	2012
Bare Ground	41.5
Litter	46.6
Rock	7.9
Biological Crusts	0
Species Canopy Cover	4.3
Species Percent Canopy Cover	2012
Red Filaree (*Erodium cicutarium*)	61.5
Joshua Tree (*Yucca brevifolia*)	35.9
Desert marigold (*Baileya multiradiata*)	2.6

Table 3-13 Data from Beaver Dam Slope Pasture West

Percent Cover	2012
Bare Ground	26
Litter	24.8
Rock	24.9
Biological Crusts	3.1
Species Canopy Cover	20.3
Species Percent Cover	2012
White Bursage (*Ambrosia dumosa*)	2.4
Four-wing Saltbush (*Atriplex canescens*)	1.8
Blackbrush (*Coleogyne ramosissima*)	85.9
Mormon Tea (*Ephedra nevadensis*)	1.8
Creosote Bush (*Larrea tridentata*)	7.7
Joshua Tree (*Yucca brevifolia*)	0.6

Table 3-14 Data from Indian Springs Pasture South

Percent Cover	*2012*
Bare Ground	30.8
Litter	38.9
Rock	18
Biological Crusts	0
Species Canopy Cover	11.4
Species Percent Cover	2012
Four-wing Saltbush (*Atriplex canescens*)	4.5
Joshua Tree (*Yucca brevifolia*)	3.0
Brittlebush (*Encelia farinosa*)	1.5
Red Filaree (*Erodium cicutarium*)	1.5
Broom Snakeweed (*Gutierrezia sarothrae*)	71.6
Antelope Bitterbrush (*Purshia tridentata*)	7.5
Turpentine Broom (*Thamnosma montana*)	9.0

Table 3-15 Data from Santa Clara Slope Pasture South

Percent Cover	2012
Bare Ground	25.5
Litter	29.6
Rock	20.5
Biological Crusts	0
Species Canopy Cover	23.2
Species Percent Cover	2012
Four-wing Saltbush (*Atriplex canescens*)	1.1
Blackbrush (*Coleogyne ramosissima*)	40.0
Mormon Tea (*Ephedra nevadensis*)	4.3
Littleleaf Ratany (*Krameria erecta*)	2.2
Creosote Bush (*Larrea tridentata*)	28.7
Turpentine Broom (*Thamnosma montana*)	4.9
Banana Yucca (*Yucca baccata*)	12.4
Joshua Tree (*Yucca brevifolia*)	6.5

"I do not believe there ever was any life more attractive to a vigorous young fellow than life on a cattle ranch in those days. It was a fine, healthy life, too; it taught a man self-reliance, hardihood, and the value of instant decision...I enjoyed the life to the full."

–Theodore Roosevelt, 26th President of the United States, 1858-1919

use data). Table 3-16 through Table 3-19 show 2012 or 2013 data from all the trend sites in the Castle Cliffs Allotment located within the NCA, including the Woodbury Desert Study Area.

3.9.2.3 Scarecrow Peak Allotment

Scarecrow Peak Allotment (Photo 3-36) is located immediately west of the Beaver Dam Slope Allotment and includes approximately 51,290 acres in Utah and 27,480 acres in Nevada (Map 3-11). There are four grazed pastures in this allotment: the Dodge Spring Pasture, Joshua/Catclaw Pasture, Terry Utah Pasture, and Terry Nevada Pasture. Additionally, this allotment includes one springtime holding pasture outside of the NCA,

Table 3-16 Summer Pasture Data

Percent Cover	2012
Bare Ground	6.1
Litter	58.5
Rock	9.5
Biological Crusts	0
Species Canopy Cover	25.6
Species Percent Cover	2012
Mormon Tea (*Ephedra nevadensis*)	10
Narrowleaf Yerba Santa (*Eriodictyon angustifolium*)	15
Broom Snakeweed (*Gutierrezia sarothrae*)	36.5
Desert Almond (*Prunus fasciculate*)	27.5
Antelope Bitterbrush (*Purshia tridentata*)	2.0
Turpentine Broom (*Thamnosma montana*)	9.0

Table 3-17 Black Warrior Pasture Data

Percent Cover	2012
Bare Ground	12.6
Litter	51.5
Rock	27.9
Biological Crusts	0.1
Species Canopy Cover	7.3
Species Percent Cover	2012
Low Woollygrass (*Dasyochloa pulchella*)	7.7
Mormon Tea (*Ephedra nevadensis*)	7.7
Broom Snakeweed (*Gutierrezia sarothrae*)	65.4
Popcorn Flower Species (*Plagiobothrys* spp.)	7.7
Mexican Bladdersage (*Salazaria mexicana*)	7.7
Turpentine Broom (*Thamnosma montana*)	3.9

Table 3-18 Desert Pasture Data

Percent Cover	2012
Bare Ground	25.9
Litter	40.4
Rock	25.3
Biological Crusts	0.3
Species Canopy Cover	8.3
Species Percent Cover	2012
Four-wing Saltbush (*Atriplex canescens*)	1.2
Red Filaree (*Erodium cicutarium*)	91.6
Creosote Bush (*Larrea tridentata*)	3.6
Prickly Pear Species (*Opuntia* spp.)	1.2

Table 3-19 Woodbury Exclosure Data

Percent Cover	2013
Bare Ground	36.2
Litter	16.5
Rock	36
Biological Crusts	0
Species Canopy Cover	4.8
Species Percent Cover	2013
Woolly Plantain (*Plantago patagonica*)	71
White Bursage (*Ambrosia dumosa*)	15.7
Mormon Tea (*Ephedra nevadensis*)	5.3
Creosote Bush (*Larrea tridentata*)	2.6

"The cock is crowing,
The stream is flowing,
The small birds twitter,
The lake doth glitter
The green field sleeps in the sun;
The oldest and youngest
Are at work with the strongest;
The cattle are grazing,
Their heads never raising;
There are forty feeding like one!"
–William Wordsworth, Poet, 1770–1850

approximately one mile north of Veyo, Utah. The Beaver Dam Wash lies along the eastern edge of Dodge Spring Pasture and bisects the Joshua/Catclaw and Terry Utah Pastures. Livestock use in all four pastures is allowed from November 1 to March 15; cattle are then removed from the portion of the Terry Nevada and Terry Utah Pastures within the Beaver Dam Slope ACEC and relocated to the northern portion of the Terry Nevada, Joshua/Catclaw, and Dodge Spring Pastures each year. As this grazing system does not follow the approved 1982 Scarecrow Peak AMP, that plan needs to be revised to reflect the system that is currently being followed.

Wildfires in 2005 and 2006 damaged native vegetation communities on approximately 80% of the allotment. As no re-seeding or other vegetation restoration treatments were undertaken by BLM below 3,800 feet in elevation after the fires, livestock were removed for one year before grazing was allowed to resume. Fire damaged areas above 3,800 feet elevation in the Dodge Spring and Joshua/Catclaw Pastures were aerial seeded with a native species, sideoats grama (*Bouteloua curtipendula*), and a non-native species, forage kochia.

Species frequency data (Table 3-20) were collected at the key area in the Terry Utah pasture of the Scarecrow Peak Allotment in the early spring of 2012 and again in 2014. While the key area is not within the NCA boundaries, it does

Table 3-20 Terry Utah Pasture Data

Percent Cover	2012	2014
Bare Ground	35.3	39.3
Litter	21.6	19.1
Rock	12.9	8
Biological Crusts	0.3	0
Species Canopy Cover	28.5	29.7
Species Percent Cover	2012	2014
Creosote Bush (*Larrea tridentata*)	41.7	43
Ratany Species (*Krameria* spp.)	13.8	9.7
Joshua Tree (*Yucca brevifolia*)	11.3	14.3
Blackbrush (*Coleogyne ramosissima*)	8.8	10.1
Species Nested Frequency 24" X 24" Quadrat	2012	2014
Creosote Bush (*Larrea tridentata*)	28	30
Ratany Species (*Krameria* spp.)	13	6
Bush Muhly (*Muhlenbergia porteri*)	1	2
Blackbrush (*Coleogyne ramosissima*)	8	10

Photo 3-36 Livestock in Scarecrow Peak Allotment at Water Trough, Beaver Dam Wash NCA

"Wildfires in 2005 and 2006 damaged native vegetation communities on approximately 80% of the Scarecrow Peak Allotment."

serve as a representative of the pasture as a whole. The data indicates static trend in that pasture.

The average actual use of this allotment during the past 10 years has been approximately 2,549 AUMs, or 56% of permitted use (refer to Appendix J for actual use data). This use reflects how impacts from extended and repeated periods of drought and the loss of forage to wildfires influence the viability of livestock grazing in the northeastern Mojave Desert.

3.9.2.4 Cedar Pockets Allotment

The approximately 9,570 acre Cedar Pockets Allotment is located in southwest Utah on the east side of the Beaver Dam Mountains (Map 3-11). This allotment is managed by BLM's Arizona Strip Field Office because it is contiguous to the Highway Allotment in Arizona. Currently, a single operator is authorized for 375 AUMs for use between October 16 and May 31 in this allotment. The grazing system is a deferred system, and allowable utilization is 45% of the annual growth of perennial forage plants by livestock. Actual use reports extend back to 1977, though records for 1988 to 1996 are missing. The maximum actual use recorded from 1977 to 2013 was 340 AUMs in 1981. The average annual actual use for the past ten years in approximately 214 AUMs which is 51% of permitted use.

Vegetation in this allotment was formerly dominated by blackbrush and Joshua trees at higher elevations, and typical Mojave Desert vegetation at the lower elevations. Recent fires in 2000 and 2006, however, have converted the entire area into annual grasslands with some shrubs and perennial grasses (Photo 3-37). Key species for this allotment are Mormon tea, winterfat, Indian ricegrass, bush muhly, and galleta (*Pleuraphis* spp.).

The Cedar Pockets Allotment long-term trend monitoring data (Table 3-21) is collected by BLM's Arizona Strip Field office using the pace frequency and point intercept methods. The first readings established a baseline for comparison to all future readings. Trend is considered as being upward when the species increases by 10% between the first and last readings. The trend of a species is static or not apparent if it shows a percent change of 0 to 10% or 0 to -10% between readings. A downward trend is a reading of more than -10% from the first reading. Overall trend at the key area is the direction of change in frequency observed between the initial reading (base year) and the current reading.

"Recent fires in 2000 and 2006 have converted the entire Cedar Pockets Allotment into annual grasslands with some shrubs and perennial grasses."

3.10 VEGETATION RESOURCE USES: PLANT MATERIALS

Various native plant materials are typically made available by BLM for harvesting or collection from public lands for commercial purposes and personal use. These include Christmas trees, fuel (fire) wood, poles and posts, and live plants, as well as seeds, nuts, and other plant materials. For commercial uses, contracts or permits are issued to authorize the harvesting or collection of vegetative products from public lands. For personal use, a permit may or may not be required depending on the material. Areas of public land where the removal of vegetation for any purpose is not desired can be closed through land use planning. Management of these resources in the NCA is described below.

3.10.1 Woodland Products

The public lands of the NCA are not currently forested by pinyon-juniper woodlands of sufficient size to be harvested in commercial quantities or for sustainable personal use as Christmas trees, fuelwood, and posts. Prior to 2003, approximately 270 acres of the NCA were covered by woodlands; however, wildfires in 2003, 2005, and 2006 destroyed a substantial portion of the woodlands (Photo 3-38). The SGFO RMP (1999, 2.36) closed the Beaver Dam Slope ACEC to all fuelwood harvesting. As the acreage of the ACEC overlaps a majority of

Photo 3-37 Fire Damaged Cedar Pockets Allotment, Beaver Dam Wash NCA

Table 3-21 Data from Terry Utah Pasture

Percent Cover	1984	1988	2010
Bare Ground	12	24	59
Litter	65	68	27
Rock	21	6	12
Biological Crusts	0	0	0
Species basal Cover	2	2	1
Species Pace Frequency	1984	1988	2010
Creosote Bush (Larrea tridentata)	2	11	1
Blackbrush (Coleogyne ramosissima)	19	7	0
Bush Muhly (Muhlenbergia porteri)	3	2	0
Mormon Tea (Ephedra nevadensis)	17	8	4
Sand Dropseed (Sporobolus cryptandrus)	1	0	4

Photo 3-38 Fire Damaged Pinyon-Juniper Woodlands, Beaver Dam Wash NCA

"Once upon a time there was a piece of wood. It was not an expensive piece of wood. Far from it. Just acommon block of firewood, one of those thick, solid logs that are put on the fire in winter to make cold rooms cozy and warm."
–Carlo Collodi, Author of *The Adventures of Pinocchio*, 1826–1890

Ethnobotany

Generations of Native Americans have used desert plants for myriad purposes: food, shelter, tools, clothing, and medicine. For Mojave Desert peoples, banana yucca was an important source of strong fiber for the construction of sandals and baskets. Some groups used the fruit of the Joshua tree for food, boiling or pit-roasting them like agave hearts (Rhode 2002).

the NCA, fuelwood harvesting has been administratively restricted to a very small area in the northeast corner of the NCA and very little, if any, harvesting of woodland products has occurred in this area since 1999 (Map 3-12).

In 2009, Congress identified three large areas of the NCA as "Designated Road Areas" (OPLMA Section 1975 (e)). In these areas, all motorized vehicle travel is limited to the specific routes shown on the legislative map of the NCA (Map 3-26). The pinyon-juniper woodlands that are outside of the boundaries of the Beaver Dam Slope ACEC are now within one of the designated road areas. As Congress did not identify any roads as being open for motorized vehicle travel to these woodlands, vehicle access to the fuelwood harvesting locations has been effectively eliminated.

3.10.2 Desert Vegetation Sales

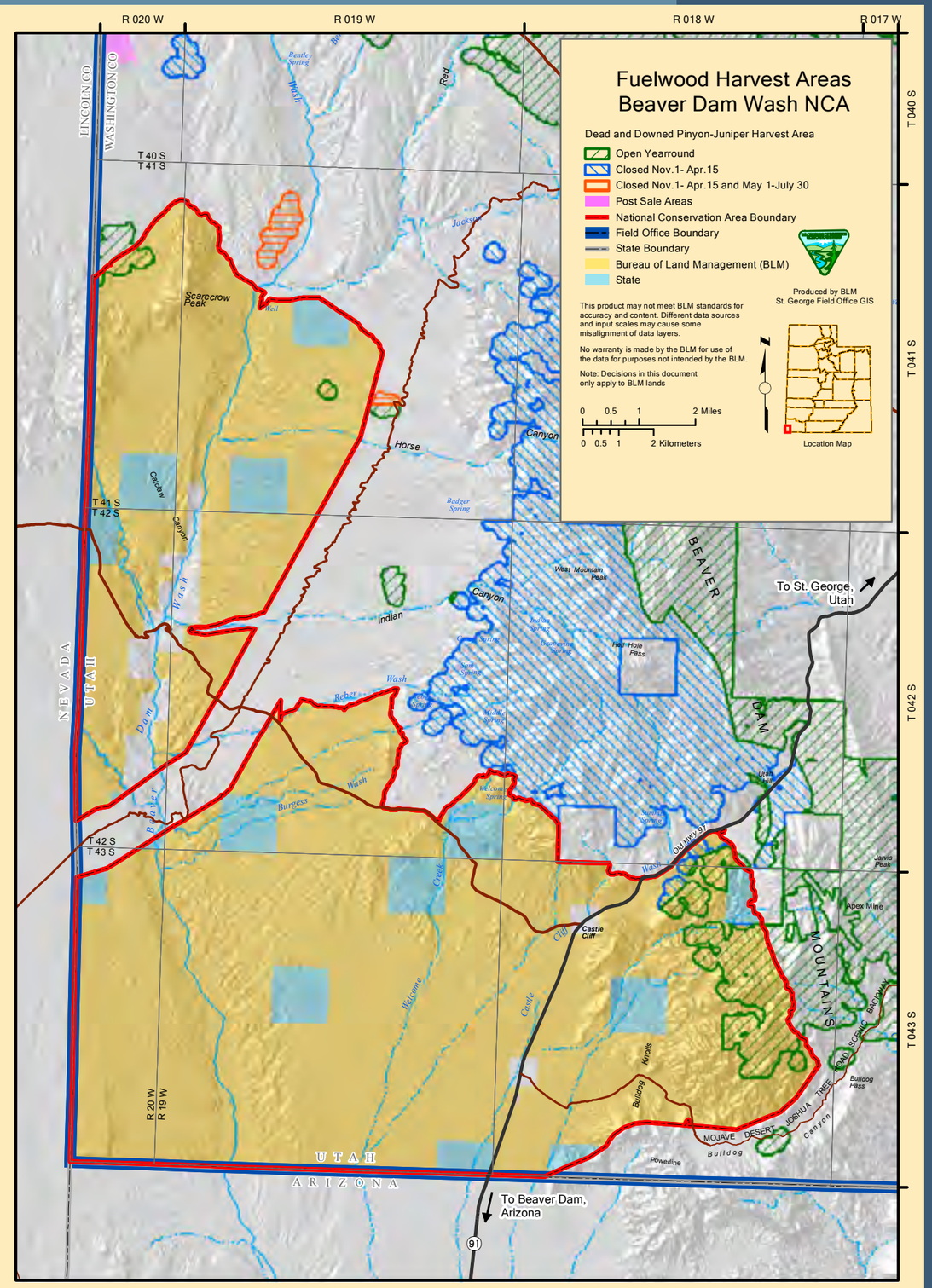
Historically, there has been considerable demand for live Mojave Desert shrubs, cacti, yuccas (Photo 3-39), and desert wildflowers, for xeriscaping, crafts, and other purposes. Yuccas have long been harvested for fibers and, along with other desert plants, for use in the manufacture of herbal medicines, soaps, and other products. The SGFO RMP (1999, 2.22) restricted authorizations to collect live desert plants to designated salvage areas only (i.e., locations where the plants would be destroyed due to project development). Exceptions to that decision included specific authorizations for the collection of native plants and plant materials for scientific purposes and by Native Americans for ceremonial or religious purposes. These authorizations excluded all federally-listed plant species from any type of collection.

3.10.3 Native Seed Collection

The SGFO RMP (1999, 2.37) restricted the collection of native seeds (Photo 3-40) for commercial and personal use within designated critical habitat for the Mojave desert tortoise and within the Beaver Dam Slope ACEC, effectively closing all but a small area of the public lands of today's NCA to collection. Where seed collection permits are issued for areas that are open to this activity, hand collection must be used (mechanical collection is prohibited) and the amount of seed that can be taken from any one area or species is limited to no more than 25% of the available seed. Restrictions are also placed on collecting seeds from areas where native vegetation communities are recovering from drought or wildfires, and areas where post-fire ES&R projects have been implemented.

Photo 3-39 Banana Yucca in Bloom, Beaver Dam Wash NCA

Photo 3-40 Joshua Tree Fruit, Beaver Dam Wash NCA



Southwestern Willow Flycatcher

Empidonax traillii extimus is a passerine bird or member of the passeriformes order of birds. A notable characteristic of passerines is their toes, which are arranged to facilitate perching. Empidonax flycatchers are difficult to tell apart in the field so biologists use their songs to distinguish between them. The most distinguishing characteristic between the southwestern willow and other willow flycatchers is their song, a sneezy "fitz-bew" (USFWS).

3.11 SPECIAL STATUS SPECIES

Special status species are defined by BLM as any of the following: (1) species listed under the federal ESA as threatened or endangered by the USFWS; species that are candidates and proposed for listing under the ESA; species that have been delisted under ESA within the past 5 years; species identified by the USFWS as "sensitive" or a "species of concern"; and (2) species designated by the appropriate BLM State Director as sensitive species that require special management consideration to promote their conservation and reduce the likelihood of future listing under the ESA.

Species that are listed as threatened and endangered under the ESA will often have critical habitat designated by the USFWS and a recovery plan prepared by the USFWS, in cooperation with researchers who have specialized expertise with that particular species and its habitat. BLM works cooperatively with USFWS to manage suitable habitat for those listed species for which no critical habitat has yet been identified or designated.

Because the NCA lies within physiographic and ecoregional transition zones, many plant and animal species found here are at the extremes of their historic ranges. Such species tend to have less stable populations than those closer to the center of their range. The unique qualities of transitional habitats make them an important research area for special status species. The diverse ecological zones represented in the NCA include relatively large areas of undisturbed habitats that provide opportunities for species reintroductions as well as the establishment of new populations of special status species.

The following sections address those species in the NCA that are currently being managed under the protections of the ESA. Species that are identified by the Utah BLM State Director as sensitive species are described in section 3.11.2.

At this time, there are no special status plant species known to occur in the NCA.

3.11.1 Special Status Wildlife Species: Threatened, Endangered, Candidate, and Species Proposed for Listing under ESA

Four species are currently listed under the ESA that occur or have the potential to occur in the NCA. Information on each species is summarized below in Table 3-22.

3.11.1.1 Southwestern Willow Flycatcher

The Southwestern willow flycatcher (SWFL) (Photo 3-41) was listed as a federally endangered species in 1995 (USFWS 1995), and received additional protection through critical habitat designation in 1997 (USFWS 1997). The NCA does not contain lands that are within SWFL designated critical habitat. A recovery plan for SWFL was developed by USFWS, other federal and state agencies, and interest groups in 2002 (USFWS 2002).

The SWFL prefers riparian habitats with dense growth of willows (*Salix* spp.), arrowweed (*Pluchea* spp.), buttonbush (*Cephalanthus* spp.), tamarisk (*Tamarix* spp.), Fremont's cottonwood, and other riparian plants. Preferred trees and shrubs are generally 12-20 feet or more in height and have a high canopy cover (USFWS 1995a). Habitat suitable for SWFL occupancy is found in the riparian zone along Beaver Dam Wash and there is some potential that this habitat would be suitable for nesting. One SWFL sighting was reported on private lands at Lytle Ranch in Beaver Dam Wash in 1985, but no others have been documented since.

This flycatcher eats insects, seeds, and berries. Breeding occurs during late spring or early summer, with peak breeding activity occurring in June. Nests are generally constructed in a vertical fork of a willow or other riparian tree. The female then lays and incubates two to four eggs; the young hatch after twelve or thirteen days. The hatchlings are tended by both parents and leave the nest after about two weeks (UDWR 2010a).

3.11.1.2 Western Yellow-billed Cuckoo

The Western yellow-billed cuckoo (Photo 3-42) was listed as a threatened species (USFWS 2014) due to declining populations attributed to habitat loss, degradation, and fragmentation. Cuckoos are usually found in large tracts of dense cottonwood or willows in riparian areas (UDWR 2010b). Population status and trends in Washington County and the NCA are unknown; however, birds have been observed along the Virgin River and some of its tributaries.

Cuckoo nesting behavior may be closely tied to food abundance, and in years of low food abundance cuckoos may forego nesting. While nesting habitat for yellow-billed cuckoos is present along the Beaver Dam Wash in the NCA, and one breeding record exists for this species from Beaver Dam Wash outside of the NCA (UDWR 2010b), no birds have been observed nesting there. The birds are migratory, arriving in Utah in late May or early June and breeding in late June through July (Parrish et al. 2002). Cuckoos typically start their southerly migration by late August or early September.

Western yellow-billed cuckoos feed almost entirely on large insects, including caterpillars, grasshoppers, cicadas, beetles, and katydids. They may also occasionally consume lizards, frogs, and eggs of other birds, and may rarely feed on berries and fruits (UDWR 2010b).

Yellow-billed Cuckoo

Coccyzus americanus occidentalis is a member of the cuckoo family, which also includes roadrunners. Most species of cuckoos are arborial, like the yellow-billed cuckoo, with a minority being terrestrial, like the roadrunner. A distinguishing feature of most cuckoos is their long tail, which terrestrial species use for steering and arborial species use as a rudder during flight.

Table 3-22 Threatened and Endangered Species

Species	Status	Occurrence
Southwestern willow flycatcher (*Empidonax traillii extimus*)	Endangered	Verified
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	Threatened	Verified
California condor (*Gymnogyps californianus*)	Endangered	Possible (unverified)
Mojave/Agassiz's desert tortoise (*Gopherus agassizii*)	Threatened	Verified

Photo 3-41 Southwestern Willow Flycatcher, Federally-Listed Endangered Species

Photo 3-42 Western Yellow-Billed Cuckoo, Federally-Listed Threatened Species

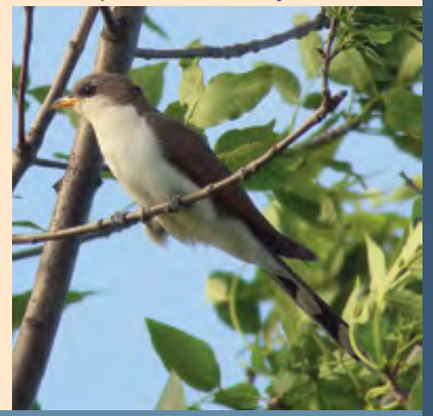
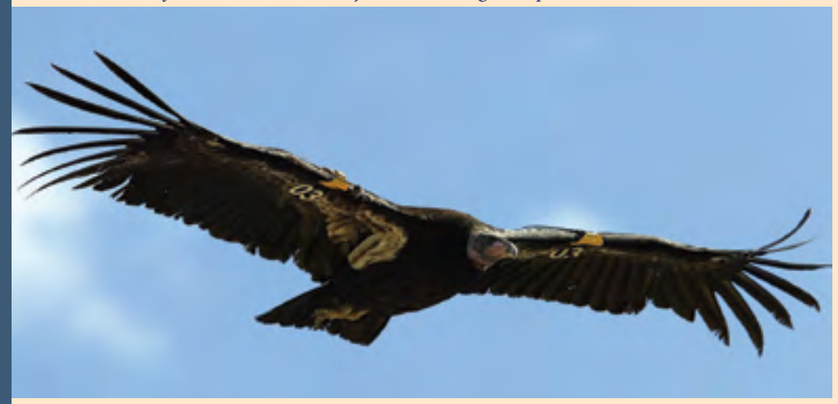


Photo 3-43 California Condor, Federally-Listed Endangered Species



3.11.1.3 California Condor

The California condor (Photo 3-43) was listed federally endangered on March 11, 1967 and noted to only occur in California (USFWS 1976). By 1987, the last wild condor was captured and taken to the San Diego Wild Animal Park. Beginning with the first successful breeding of California condors in 1988, the population grew to 121 in 1996, including 104 in the captive flock, and 17 in the wild. On October 16, 1996, USFWS announced plans to reintroduce California condors into northern Arizona and designate these birds as nonessential experimental populations, as provided by Section 10j of the ESA (USFWS 1996b). A portion of Washington County is within the experimental population area (USFWS 1996b; USOFR 1997); however, California condors observed in NCA would be outside the boundary of the experimental non-essential population areas, and subject to the full protection of the ESA.

3.11.1.4 Mojave Desert Tortoise

Since 1971, the population of desert tortoise (also known as Agassiz's land tortoise) on the Beaver Dam Slope (Slope) of southwestern Washington County, Utah, has been considered to be declining and in need of protection (Photo 3-44). On August 20, 1980, USFWS listed this population as a threatened species and designated approximately 25,000 acres of critical habitat on the Slope (USFWS 1980).

In 1990, USFWS listed all desert tortoise populations north and west of the Colorado River as "threatened". In 1994, critical habitat was designated and a recovery plan developed for this species that established recovery units throughout its range. In 2011, the recovery plan was revised and recovery unit boundaries were adjusted to include all potential tortoise habitats within the range of the species. The NCA is within the Utah-Arizona portion of the Northeast Mojave Recovery Unit, a recovery unit that includes habitat in Utah, Arizona, and Nevada. Map 3-13 displays the designated critical habitat for Mojave desert tortoise in the NCA; Map 3-14 displays a model of habitat quality variations within the NCA.

Because it can live over 50 years, the desert tortoise is an "indicator species" that is useful for evaluating the health of the Mojave Desert ecosystem. Over millions of years of evolution, the species has successfully adapted to changing environmental conditions and has been able to flourish, even in the highly variable and harsh environment of the Mojave Desert.

Desert tortoises spend the majority of their lives underground in winter dens, summer burrows, pallets or soil depressions, or openings in rock or caliche (Photo 3-45). In each of these shelter types, tortoises are protected from the

California Condor

With a face only a mother could love, *Gymnogyps californianus* is a member of the vulture order. Like other vultures, condors are scavengers, feeding on dead mammals. The young, however, are fed by regurgitation. A wing span of nine to ten feet allows condors to soar on air currents to heights of 15,000 feet and travel hundreds of miles in one flight.

Photo 3-44 Mojave Desert Tortoise, Federally-Listed Endangered Species

temperature extremes of the Mojave Desert. Dens and burrows are dug into the banks of shallow ephemeral drainages; these are susceptible to surface disturbances that can collapse the entrances, trapping and suffocating the occupants. Woodbury and Hardy (1948) observed large communal winter tortoise dens and considered this to be a unique adaptation of the Slope's tortoise population. According to Coombs (1977, 88), the winter dens were permanent structures, excavated 10-30 feet under the caliche layer, in south-facing banks of ephemeral washes.

Individuals generally remain in winter dens between October and mid-March, emerging to feed and mate during the late winter and early spring when daily high temperatures are in the 70s. Tortoises are active above ground during the spring, then retreat to summer burrows and shaded shrub cover to escape the intense summer heat of the Mojave Desert. During the summer months, tortoise activity periods occur at sunrise and sunset when the animals leave their shelters to feed.

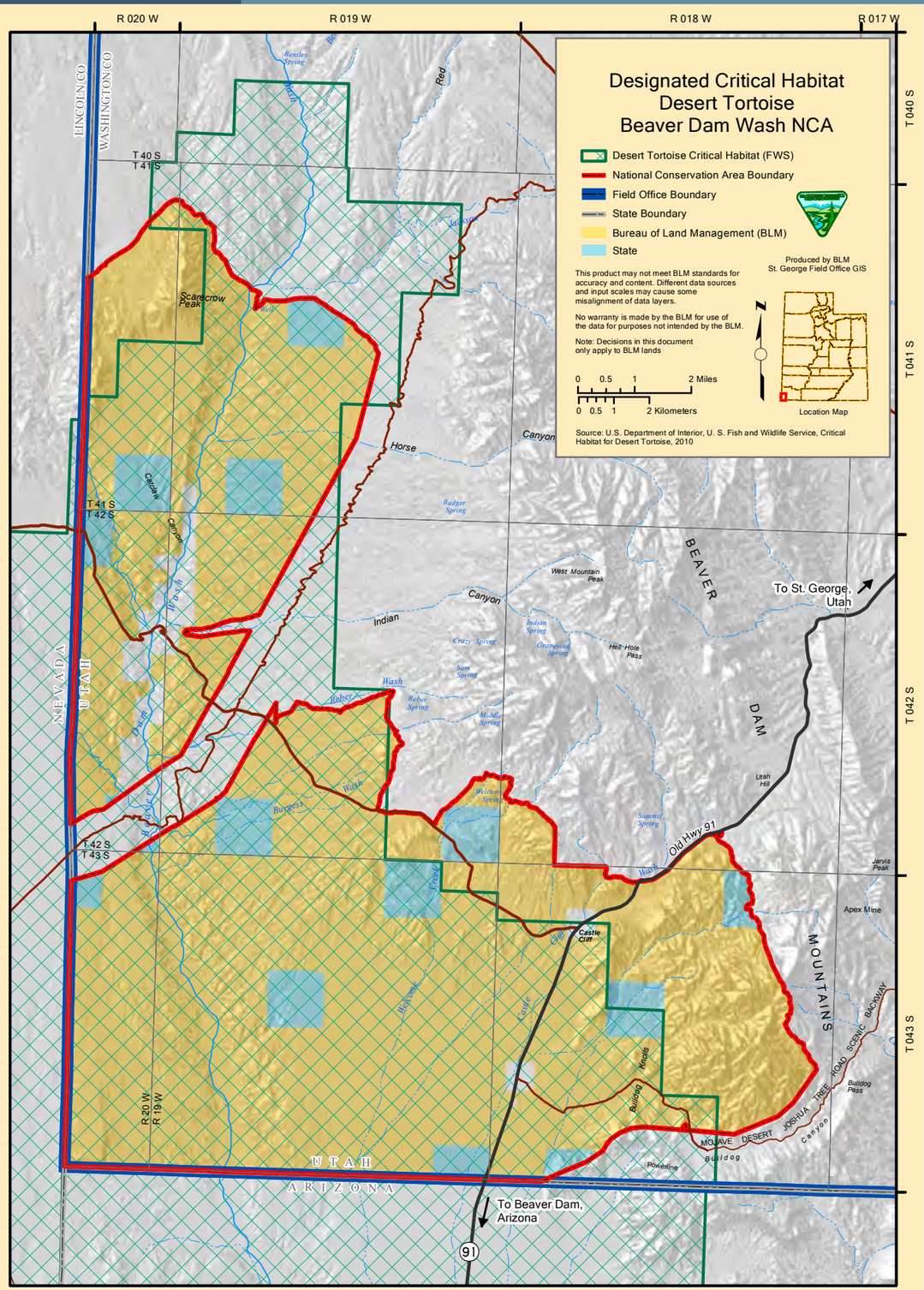
Desert tortoises also retreat to their dens or burrows to lower their metabolic rates and minimize water loss. Adult tortoises lose water so slowly that they can survive for more than a year without access to "free" water (water not derived from plants). While in burrows, individuals

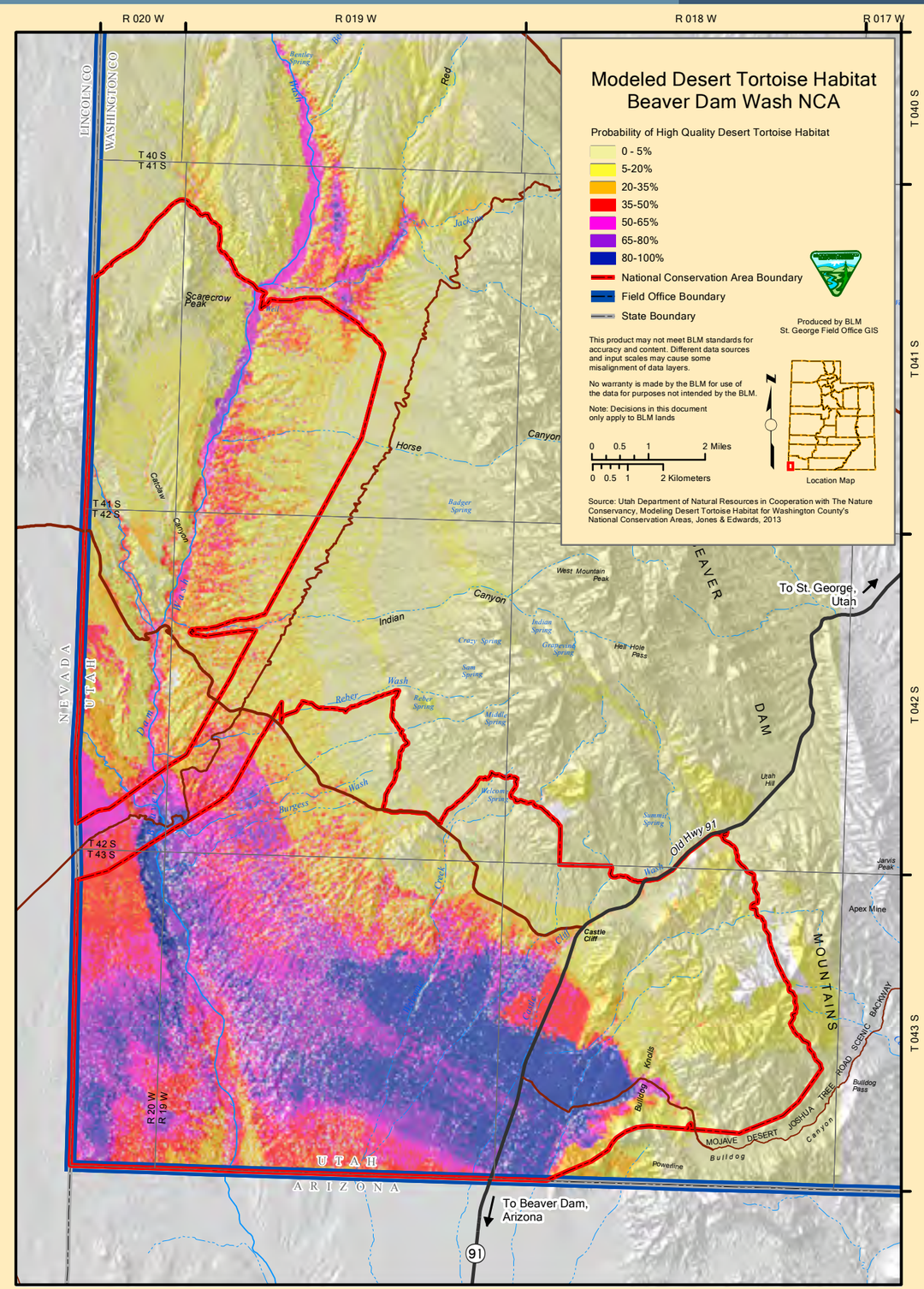
Photo 3-45 Desert Tortoise Den, Woodbury Study Area, Beaver Dam Wash NCA

consume very little food. Desert tortoises can tolerate extreme water and caloric imbalances, allowing them to survive lean years and exploit resources that may only be periodically available. During years of average or better than average precipitation and forage production, desert tortoises can balance their water budgets and have a positive energy balance, affording an opportunity for growth and reproduction. The mechanisms by which desert tortoises maintain their energy and water balances during periods of fluctuating resource availability are still not completely understood (USFWS 1994).

Slow to mature, desert tortoises do not reach sexual maturity until they are between the ages of 13-20 years (USFWS 1994). Mating generally occurs in the spring or fall, but may take place whenever tortoises are active. Females lay

"...when the last individual of a race of living things breathes no more, another heaven and another earth must pass before such a one can be again."
–Charles William Beebe, American Naturalist, Explorer, Author, 1877-1962


Designated Critical Habitat
Desert Tortoise
Beaver Dam Wash NCA
Desert Tortoise Critical Habitat (FWS)
National Conservation Area Boundary
Field Office Boundary
State Boundary
Bureau of Land Management (BLM)
State
Produced by BLM
St. George Field Office GIS
This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.
Note: Decisions in this document only apply to BLM lands
0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
Location Map
Source: U.S. Department of Interior, U. S. Fish and Wildlife Service, Critical Habitat for Desert Tortoise, 2010
R 020 W
R 019 W
R 018 W
R 017 W
T 040 S
T 041 S
T 042 S
T 043 S
T 40 S
T 41 S
T 41 S
T 42 S
T 42 S
T 43 S
R 20 W
R 19 W
LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
BEAVER DAM MOUNTAINS
Scarecrow Peak
Red Horse Canyon
Horse Canyon
Caldaw Canyon
Indian Canyon
West Mountain Peak
Hell Hole Pass
Bentley Spring
Badger Spring
Crazy Spring
Indian Spring
Grapevine Spring
Sam Spring
Reber Spring
Middle Spring
Welcome Spring
Summit Spring
Utah Hill
Jarvis Peak
Apex Mine
Castle Cliff
Bulldog Knolls
Bulldog Pass
Powerline
Old Hwy 91
Reber Wash
Burgess Wash
Castle Wash
Welcome Wash
Bulldog Canyon
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
To St. George, Utah
To Beaver Dam, Arizona
91


Modeled Desert Tortoise Habitat
Beaver Dam Wash NCA
Probability of High Quality Desert Tortoise Habitat
0 - 5%
5-20%
20-35%
35-50%
50-65%
65-80%
80-100%
National Conservation Area Boundary
Field Office Boundary
State Boundary
Produced by BLM
St. George Field Office GIS
This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.
Note: Decisions in this document only apply to BLM lands
0 0.5 1 2 Miles
0 0.5 1 2 Kilometers
Location Map
Source: Utah Department of Natural Resources in Cooperation with The Nature Conservancy, Modeling Desert Tortoise Habitat for Washington County's National Conservation Areas, Jones & Edwards, 2013
R 020 W
R 019 W
R 018 W
R 017 W
T 040 S
T 041 S
T 042 S
T 043 S
T 40 S
T 41 S
T 41 S
T 42 S
T 42 S
T 43 S
R 20 W
R 19 W
LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
BEAVER DAM MOUNTAINS
Scarecrow Peak
Red Horse Canyon
Horse Canyon
Caldaw Canyon
Indian Canyon
West Mountain Peak
Hell Hole Pass
Bentley Spring
Badger Spring
Crazy Spring
Indian Spring
Grapevine Spring
Sam Spring
Reber Spring
Middle Spring
Welcome Spring
Summit Spring
Utah Hill
Jarvis Peak
Apex Mine
Castle Cliff
Bulldog Knolls
Bulldog Pass
Powerline
Old Hwy 91
Reber Wash
Burgess Wash
Castle Wash
Bulldog Canyon
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
To St. George, Utah
To Beaver Dam, Arizona
91

"Hatchling tortoises are about two inches in diameter and have a soft shell for the first three years of life, making them vulnerable to all predators. Less than 5% of all hatchlings survive to maturity."

egg clutches at the mouth of their dens, where the sun incubates the eggs for 90-120 days. The clutches are vulnerable to predation by Gila monsters, kit foxes, various snakes, and coyotes; predation typically results in the loss of 60-90% of the eggs laid by the female.

Hatchling tortoises (Photo 3-46) are about two inches in diameter and have a soft shell for the first three years of life, making them vulnerable to all predators. Less than 5% of all hatchlings survive to maturity (age 20), at which time they are about 15 inches long and weigh approximately 15 pounds. Adults are generally protected against non-human predators by their external shells and their use of burrows and dens for shelter from most environmental hazards.

Desert tortoises are "dietary specialists", foraging selectively on forbs (Photo 3-47), grasses, shrubs, and succulent plants (cf. Jennings 1997; Minden 1980; Grover and DeFalco 1995). They must respond to the extreme seasonal and annual variability in the biomass and diversity of the annual plants that are their primary food source (Oftedal, Hillard, and Morafka 2002, 341). During drought periods in the Mojave Desert, for example, very little or no annual germination may occur, while during "El Nino" cycles, winter annuals may sprout profusely. Tortoises alter their diets in response to these natural fluctuations in species availability and also selectively forage based on the palatability and nutrient content of the available species (Jennings 2002, 357). Plants containing essential dietary nutrients for growth and reproduction, such as water, protein, fiber, nitrogen, phosphorus, calcium, and magnesium, are selectively consumed, while those that contain high concentrations of potassium are generally avoided. Since tortoises lack salt glands, they can only excrete high levels of potassium through urine, which depletes both water and nitrogen from their systems (Oftedal, Hillard, and Morafka 2002, 342).

According to Minden's studies (1980, 16) on the Slope during the spring of 1980, the small forb *Astragalus nuttalianus* (locoweed) was the preferred spring forage for tortoises. Tortoises were also observed consuming Indian ricegrass and the invasive brome grasses (Photo 3-48). Woodbury and Hardy (1948) and Coombs (1977) observed that desert tortoises selectively grazed on the once abundant native perennial grass bush muhly or "mesquite grass" despite its relative rarity in the native plant community after years of overgrazing by domestic livestock. Coombs (1977, 126) stated that bush muhly and other perennial grasses may have been the most important plants for desert tortoises as they retained moisture long after the annual grasses had cured, and "greened up" again after summer rain.

Spring is a critical time for tortoises to replenish fat reserves used during hibernation. Annual forbs are particularly important for tortoises in the spring as essential nutrients, particularly minerals, can be more readily obtained from them (Hazard et al. 2011). Until the 1970s, domestic sheep trailing and overgrazing in general on the Slope significantly reduced the availability of spring annuals for tortoises. As Woodbury and Hardy observed during the decade that they conducted tortoise studies on the Slope in the 1930s and 40s, "tortoises only had a few days of the 30-40 day green period when sheep swept the carpet clean" (Coombs 1977, 132).

Perennial grasses may be more important as a late summer source of water and nutrients. Without the perennial grasses, tortoises can become dehydrated in summer resulting in a buildup of electrolytes, especially potassium ions (Coombs 1977; Woodbury and Hardy 1948). During years with a poor crop of spring annuals, perennials may be the main source for meeting these demands. In many areas of the Mojave Desert, native annual

forbs and perennial grasses have been replaced by invasive exotic species. The exotic forbs and grasses today make up a substantial portion of the diet of some desert tortoise populations. Where exotic grasses have reduced the availability of annual forbs, the overall nutritional quality of desert tortoise diets may be affected due to the lower nutritional value of these grasses (Hazard et al. 2011).

Several studies have shown that calcium, nitrogen, phosphorus, magnesium, and potassium are important nutrients in desert tortoise physiology (Oftdal et al. 2002; Hazard et al. 2011). Calcium, nitrogen, and phosphorus, as well as protein, are important to juvenile desert tortoises for growth and development. Native plants are typically high in potassium and low in nitrogen. When consuming plants with high potassium concentrations, desert tortoises must excrete excess potassium in order to maintain electrolyte balance and avoid potentially toxic effects. Unlike chuckwalla and desert iguanas, desert tortoise can only excrete excess salts through the production of uric acid, which depletes their metabolic water and nitrogen and can potentially impact their growth and reproduction.

Photo 3-46 Desert Tortoise Hatchling, Red Cliffs NCA

Photo 3-47 Desert Tortoise Foraging on Cryptantha, Red Cliffs NCA

Photo 3-48 Desert Tortoise with Vegetation in Mouth, Red Cliffs NCA

"In many areas of the Mojave Desert, native annual forbs and perennial grasses have been replaced by invasive exotic species. The exotic forbs and grasses today make up a substantial portion of the diet of some desert tortoise populations."

"Since the desert tortoise typically spends 98% of its life underground, soil must be suitable for digging burrows to an average depth of 20 inches, as well as sufficiently free of rocks to permit digging yet compact enough to maintain a strong arch-shaped opening."

Photo 3-49 Tear Drop-Shaped Desert Tortoise Excrement, Red Cliffs NCA

Photo 3-50 Desert Tortoise Den with Characteristic Arch-Shape

Where tortoises have a wide array of species available to them, they will generally, but not always, selectively choose plants or plant parts that are higher in water and nitrogen (high in the Potassium Excretion Potential Index (PEP))and allow them to excrete excess potassium (Oftdal et al. 2002) (Photo 3-49). Data on cured perennial grasses indicate that they become high in the PEP index only after winter rains have leached out residual potassium, making them an important food source in the year following germination.

Bush muhly is a remarkable exception in that, unlike other perennial grasses, it continues to be high in the PEP index in summer and fall. Woodbury and Hardy (1948) and Coombs (1977, 126) concluded that bush muhly "is or once was" the most important food source for tortoises in Utah. Their observations led Coombs (1979) to assert that the reduction in the availability of bush muhly—once abundant throughout the range of the desert tortoise but, as a consequence of overgrazing by domestic livestock, severely depleted over time—was a causal factor in the obvious declines in desert tortoise numbers on the Slope.

Photo 3-51 East facing Desert Tortoise Dens in Wash, Beaver Dam Wash NCA

The desert tortoise requires very little forage and survives on approximately 23 pounds of vegetation per year. Larger grazing animals, such as domestic cattle, utilize substantially more forage. For example, a cow with a calf needs 10,000 pounds of forage per year, consuming more in one day than a tortoise does all year. Coombs (1977, 133) conducted a study of the dietary overlap between cattle and tortoises, using fecal samples to make the dietary determinations. The results of this study indicated a "total of 37.69 percent of species overlap in the diet, based on the volume and number of a species utilized in the food diet". In good precipitation years, the production of annuals on the Slope can exceed 500 pounds per acre. During these good production years, it would appear that enough forage would be available for both the desert tortoise and livestock. Recent research has suggested, however, that even if forage is periodically abundant, the quality of the forage may not be adequate to meet the tortoise's nutritional needs, particularly after the plants have dried. Few forage species individually supply a complete balance of nutrients for tortoises; if desert tortoises are to survive and recover in numbers, it is necessary to ensure that a wide variety of native species continue to be present in the Mojave Desert and available to desert tortoises in order to meet their nutritional needs as well as those of other native wildlife species.

Soil physical properties, landforms, slope, aspect, and vegetative community characteristics combine to create habitat that is suitable for desert tortoises. Since the desert tortoise typically spends 98% of its life underground, soil must be suitable for digging burrows to an average depth of 20 inches, as well as sufficiently free of rocks to permit digging yet compact enough to maintain a strong arch-shaped opening (Photo 3-50). Rock content, soil texture, pH, and depth to a restrictive layer (e.g., hardpan) are all physical characteristics of soil that would contribute to its suitability for tortoise burrowing. Soil temperature may also be an important consideration since a soil that is either too hot or cold on an average annual basis would not help the tortoise to regulate is body temperature.

Landforms, and their slope and aspect, create micro-environments that have varying degrees of suitability as habitat for desert tortoise. Dissected landforms, cut by drainages, create more diverse micro-environments. Slope and aspect of the landforms also influence the quality of the habitat, with south-facing slopes being hotter and drier than those that are north-facing. (Photo 3-51)

Vegetation classes with a more developed vertical structure of Mojave Desert shrubs provide shade to tortoises and are, therefore, considered to be of greater importance in habitat suitability. Creosote-bursage and blackbrush communities have been given the highest rankings for desert tortoise habitat suitability. Vegetation classes that provide more forage in the form of herbaceous native vegetation are also considered to be a characteristic of habitat suitability. Brome grasses and other non-native species also impact habitat suitability if the other parameters of shrub structure and native forage species are not present.

Population Trends

Tortoise research began on the Slope in the 1930s and has continued until the present day, making it one of the longest continuously studied species in the Western hemisphere. Based on the time depth of these studies, it is clear that tortoise population densities were much higher in the past than they are today (cf. USFWS 2008, 2009, 2010). As examples, Woodbury and Hardy (1948, 187) described their study area between 1930 and 1935 as consisting of 1,200 acres that represented the "home area of a semi-isolated colony of approximately

"The desert tortoise requires very little forage and survives on approximately 23 pounds of vegetation per year."

300 tortoises". From these data, they concluded there were 2,000 or more tortoises in the estimated 70 square mile area of the Slope, and described the area as being potentially good habitat but for the impacts to the native vegetation communities as a direct result of overgrazing by sheep and other livestock.

However, Hardy reported to Coombs (1977) that young tortoises had been "uncommon" in his study area in 1948, signaling that the tortoise reproduction and/or survival rates were already being impacted by conditions on the Slope. Woodbury and Hardy (1948) further observed that the gender ratios of their tortoise study population were skewed in favor of males. They attributed the skewed ratios to the influence of tortoise collection by sheepherders and others, with more females than males being removed from the local population. The home ranges of the female tortoises were smaller and more closely tethered to winter dens, making them more vulnerable to capture once the collectors located a den.

In the mid-1970s, Coombs (1977) estimated the tortoise population at approximately 350 animals, or about 27 tortoises per square mile of habitat. He considered this "a figure 5.7 times lower than what the area might be capable of sustaining." In his view, the distribution of winter dens influenced the limitations on tortoise distribution, as did the gender structure of the local population which he determined to be 64.7% male and 35.3% female (Coombs 1977, 82). Using these data, Coombs argued that the tortoise habitat quality on the Slope should be capable of supporting 154 tortoises per square mile, or one tortoise for every 4 acres. Other researchers developed different estimates of tortoise densities on the Slope, with Minden (1980) reporting as many as 178 tortoises per square mile, while Walker (1986) concluded there were no more than 34-47 tortoises per square mile. Concurrently, the tortoise population dropped from an estimated 2,000 individuals in the 1940s (Coombs 1974) to only 350 native and 68 feral captives.

Coombs (1974) reported on the efforts by UDWR to augment the declining tortoise populations and adjust the male/female population ratios through the reintroduction of 68 captive female tortoises to the area of Castle Cliff Wash, in the NCA. As no wild tortoises appeared to be present in this area, it was believed that the captive transplants would not disrupt the gene pools or spread infections to tortoises in adjacent areas. The captive tortoises were not tested for diseases, so it is possible that a highly contagious tortoise Upper Respiratory Disease (URD) could have been introduced to the local tortoise populations through this well-intended human intervention (Minden 1980; Minden and Keller 1981; Fridell and Coffeen 1986).

Beginning in the spring of 2001, USFWS began annual tortoise population monitoring studies across the species' range to determine trends in populations. Tortoise populations in the Beaver Dam Slope Subunit (in Utah and Arizona) of the Northeastern Mojave Recovery Unit have been estimated annually based on a line distance sampling. Table 3-23 displays desert tortoise population and density estimates from 2008 to 2012.

The apparent increase in the number and density of tortoises detected may be a result of improved training of field crews by the USFWS, increasing the reliability of the monitoring studies. However, these data may also represent actual increases in the tortoise populations in this subunit as a result of BLM's implementation of management recommendations from the 1994 recovery plan. Tortoise numbers may also have been influenced by the temporary closure of public lands to livestock grazing following the large-scale wildfires of 2005 and 2006, reducing competition between tortoises and livestock for forage and decreasing the effects of trampling on burrows and juvenile tortoises.

"The level of tortoise predation in the Beaver Dam Wash NCA is not conclusively known."

The level of tortoise predation in the NCA is not conclusively known. The large utility transmission lines that cross public lands along the boundaries of the NCA would provide roosting and nesting opportunities for raven, a tortoise predator. Raven predation on tortoises is typically more frequent near urban areas where the birds forage in landfills and roost or nest on power transmission towers and poles. During a three year monitoring study along the unimproved road that travels northwesterly from Castle Cliff along the NCA boundary during 2005-2008, 39 ravens and 53 raptors (six total species of raptors) were observed (JBR Environmental 2009, 1). None were noted to be perched on power poles or other man-made features.

Fire has significantly impacted tortoise habitat within the NCA, with the damage becoming more severe as non-native grasses expand. Since 2000, wildfires have burned or re-burned nearly 50% of the NCA (Photo 3-52). The burned areas are of decreased value to desert tortoise since invasive annual grasses that do not satisfy the nutritional requirements of tortoises have replaced their preferred food source of native forbs and bunchgrasses. Native shrub cover has also decreased significantly, reducing an important source of shade during the summer. Given that the heat of the mid-day summer sun can be deadly to tortoises if they are caught

"Fire has significantly impacted tortoise habitat within the Beaver Dam Wash NCA."

Table 3-23 Tortoise Populations and Densities in the Beaver Dam Slope Subunit

Year	No. Of Tortoises Observed (N)	Tortoise Density (Per Km2)	Estimated No. Of Tortoises (N Est.)	95% Confidence Interval	
				Lower Limit	Upper Limit
2008	4	1.1	778	295.8	2,046.6
2009	10	3.2	2,251	901.9	5,620.3
2010	23	3.3	2,323	1,342.8	4,018.4
2011	23	3.3	2,407	1,184	4,893
2012	38	5.4	4,059	2,279	7,230
Sources: USFWS 2010 (a); USFWS 2010 (b); USFWS 2012 (a); USFWS 2012 (b)					

Photo 3-52 Fire Damaged Landscape in Castle Cliffs Wash Area, Beaver Dam Wash NCA

without shade, the lack of shrubs restricts tortoises to areas closer to dens.

3.11.2 Utah BLM Sensitive Species

This category of species includes those that are on the Utah BLM State Director's Sensitive Species list. The public lands that provide habitats for sensitive species are managed to help ensure that these species do not require future listing under the ESA. The species that have been observed in the NCA, or that could potentially be found here, are described below.

3.11.2.1 Fish

Virgin Spinedace

The Virgin spinedace (*Lepidomeda mollispinis*) is a small minnow that was formerly found throughout the Virgin River system of Utah, Nevada, and Arizona. In the 1980s, however, spinedace populations began to decline due to habitat fragmentation, stream flow alterations, and the introduction of nonnative fishes. On May 18, 1994, this species was proposed for listing as a threatened species (USFWS 1994b) and critical habitat identified. In 1995, the Virgin Spinedace Conservation Agreement was executed by state, local, and federal agencies to provide protection to the Virgin spinedace and habitat, so that federal listing would not be required (UDWR 2002).

Virgin spinedace are opportunistic feeders that eat insects, insect larvae, other invertebrates, and plant matter. The species spawns during spring and late summer, usually during periods of high flows. Virgin spinedace prefer the clear, slow-moving water of creeks and small streams and are usually found in areas with abundant cover. Within the NCA, this native fish is found in the Beaver Dam Wash.

Desert Sucker

The desert sucker (*Catostomus clarki*) is found in the Virgin River and its major tributaries, including the Beaver Dam Wash. Desert suckers are bottom dwelling fish that primarily eat algae, although insects and other invertebrates are also occasionally consumed. Spawning occurs in riffles during the winter and spring (UDWR 2010b).

3.11.2.2 Raptors

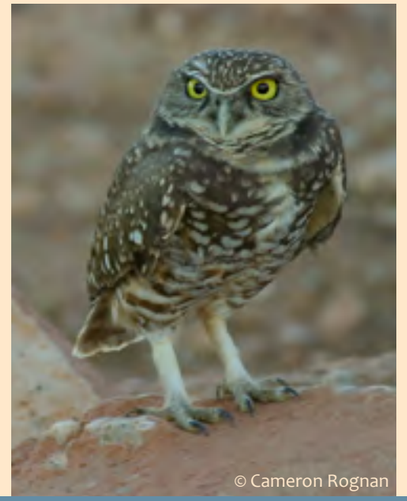
Bald Eagle

The American bald eagle (*Haliaeetus leucocephalus*) was first protected under the Bald and Golden Eagle Protection Act of 1940, and was later listed as an endangered species in most of the lower 48 states in 1967 (USFWS 1967). Since 1967, bald eagle populations have increased in numbers and expanded in range. In 2007, the bald eagle was delisted by USFWS. Fish and waterfowl are the primary sources of food for bald eagles but they will also feed on carrion, rabbits, and small rodents (UDWR 2010b). Bald eagles have been sighted in Beaver Dam Wash; population trends or numbers within the NCA are not known.

Burrowing Owl

The burrowing owl (*Athene cunicularia*), an uncommon permanent resident in Washington County, prefers open areas within deserts, grasslands, and sagebrush steppe communities (Photo 3-53). This small owl consumes a varied diet of small mammals, birds, frogs, toads, lizards, and

Photo 3-53 Burrowing Owl, Utah BLM Sensitive Species



© Cameron Rognan

Burrowing Owl

Cowsboys sometimes called *Athene cunicularia* "howdy birds" because they seemed to nod in greeting from the entrances to their burrows. Less than 12 inches in height and standing on long legs, this owl has an undeniable charm. (Audubon 2015)

snakes. It nests in abandoned burrows dug by ground squirrels or badgers; when these are not available, the owls will sometimes excavate their own nest burrows. Usually five to nine eggs are incubated by the female parent for 27-30 days, during which time she remains in the nest and is brought food by the male. The young are tended by both parents and fledge after about 40-45 days (UDWR 2010b). No special use areas for burrowing owls have been identified in the NCA, although good habitat is present. Population trends or numbers are unknown.

Ferruginous Hawk

Ferruginous hawks (*Buteo regalis*) are distributed throughout most of the state of Utah (Photo 3-54). Their numbers are directly correlated with the available prey base, so populations are highly variable. They nest in flat and rolling terrain in grassland or shrub steppe, and avoid high elevations, forests, and narrow canyons. Ferruginous hawks have been seen in and near Beaver Dam Wash within the boundaries of the NCA; population trends or numbers are not known.

Northern Goshawk

The northern goshawk (*Accipiter gentilis*) occurs as a rare, permanent resident in Washington County that prefers mature mountain forests and riparian habitats. Nests are constructed in trees in mature forests; nests previously used by northern goshawks or other bird species are often reused. Females lay and then incubate a single clutch of two to four eggs which hatch in 32-34 days. Young are able to fly at about 5-6 weeks of age, but they are still dependent on their parents for food until they reach about 10 weeks of age. Major prey species include rabbits, hares, squirrels, and birds (UDWR 2010b). The northern goshawk has been sighted in Beaver Dam Wash at Lytle Ranch; population trends or numbers within the NCA are not known.

Photo 3-54 Ferruginous Hawk, Utah BLM Sensitive Species

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Short-eared Owl

The short-eared owl (*Asio flammeus*), a rare, winter resident of Washington County, has been sighted along Beaver Dam Wash within the NCA. It is a medium-sized owl that frequently flies during daylight, especially at dusk and dawn, as it forages for rodents. This owl is usually found in grasslands, shrublands, and other open habitats. It is nomadic, often choosing a new breeding site each year based on local rodent population densities. In winter, some birds migrate south though many remain in the vicinity of their breeding grounds as year-round residents.

3.11.2.3 Other Bird Species

American White Pelican

During spring and fall migration periods, American white pelicans (*Pelecanus erythrorhynchos*) can be observed at reservoirs and wetlands throughout Washington County. American white pelicans are highly social birds and are both diurnal and nocturnal foragers, consuming fish as their primary food source (UDWR 2010b). In April of 2004, birdwatchers counted 37 American white pelicans in Beaver Dam Wash on the private lands of Lytle Ranch. There are no other recorded sightings for this species in the NCA.

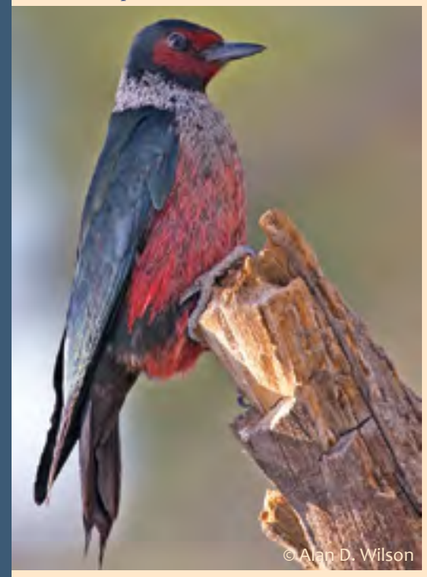
Ferruginous Hawk

Buteo regalis is the largest of the buteo hawks. Soaring on broad wings held in a shallow V, the Ferruginous hawk swoops down to catch ground squirrels, snakes, young jackrabbits, and other small to medium sized prey. But it employes a variety of hunting techniques, including soaring high, flying low, sitting on a perch, or searching the ground by foot. (Audubon 2015)

Lewis's Woodpecker

Melanerpes lewis seldom excavates wood for boring insects. Instead, it gleans insects from the tree surface, or most commonly, flycatches. It spends long periods of time watching for flying insects from the top of a pole or dead tree, and then flies out to catch them in flight. (Cornell 2015)

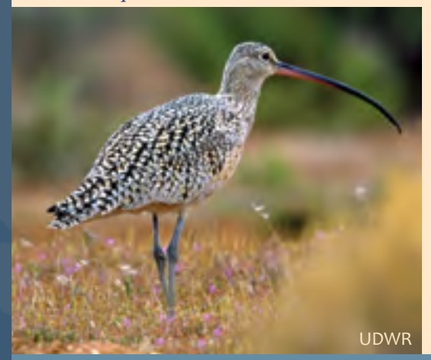
Photo 3-55 Lewis's Woodpecker, Utah BLM Sensitive Species



Lewis's Woodpecker

Lewis's woodpecker (*Melanerpes lewis*) is a habitat specialist, with primary breeding habitat in forests and riparian areas. Winter habitat includes open woodlands and lowland riparian areas (Photo 3-55). Lewis's woodpecker is a cavity nester that nests in dead or dying trees, often using previously excavated holes. The diet of this woodpecker is primarily composed of insects during the breeding season, and nuts and berries during the fall and winter (UDWR 2010b). Lewis's woodpeckers have been reported in Beaver Dam Wash at Lytle Ranch; population trends or numbers are not known.

Photo 3-56 Long-Billed Curlew, Utah BLM Sensitive Species



Long-billed Curlew

Long-billed curlews (*Numenius americanus*) are present around major water sources in Washington County during spring and fall migrations (Photo 3-56). The birds consume crustaceans, mollusks, worms, toads, the adults and larvae of insects, and sometimes berries. They nest on the ground in dry grasslands where sufficient cover and abundant prey exist (UDWR 2010b). Long-billed curlews have not been documented within the NCA, but are probably occasional visitors to Beaver Dam Wash during the winter months.

3.11.2.4 Migratory Birds and Birds of Conservation Concern

Appendix G provides a listing of 133 species of Migratory Birds and Birds of Conservation Concern that are known to utilize the Beaver Dam Wash NCA.

In the arid Southwest, riparian habitats are among the most productive habitats for bird breeding, wintering, and migration, and have some of the highest densities of breeding birds in North America. Approximately 60% of the Birds of Conservation Concern may use riparian/aquatic habitat here in Washington County (BLM 1999b). Many of the Birds of Conservation Concern use Washington County as "stop over" or migration habitat, as the birds move through the area in early spring (March and April) and again in the fall (September through December). The energy demands on migrating birds are extremely high, and birds rest and feed, before continuing their migration journey.

Photo 3-57 Bird Cover and Forage: Desert Almond with Fruit

Upland areas adjacent to riparian/aquatic areas are also critical to migratory birds. These habitats provide cover and important forage species, including mesquite, desert willow (*Chilopsis linearis*), pinyon pine, juniper, desert almond (*Prunus fasciculate*) (Photo 3-57), four-winged saltbush (*Atriplex canescens*), quail bush (*Atriplex lontiformis*), Anderson wolfberry, brittlebush (*Encelia* spp.) (Photo 3-58), live oak (*Quercus turbinella*), Utah serviceberry (*Amelanchier utahensis*), buck brush (*Ceanothus greggii*), manzanita (*Arctostaphylos* spp.), squaw bush (*Rhus trilobata*) (Photo 3-59), and bitterbrush (*Purshia tridentata*).

In 2005, the Intermountain West Joint Venture partners within Utah developed a coordinated implementation plan for bird conservation in Utah that identified habitat priorities. The Beaver Dam Wash within the NCA was identified as a Bird Habitat Conservation Area, to be protected in the future for its important habitat values.

3.11.2.5 Mammals

Allen's Big-Eared Bat

Allen's big-eared bat (*Idionycteris phyllotis*) is one of the most poorly known bat species in North America. It was not discovered in the United States until 1955, and it was not identified in Utah until 1969. The species is only found in the southern portion of the state. Preferred habitats include rocky and riparian areas in woodland and scrubland regions. Little is known about the breeding activity of the species, but females have been observed with a single offspring during the late spring and early summer. Allen's big-eared bat is an insectivore, capturing its prey in flight or plucking insects from vegetation. The species is nocturnal, roosting in caves or rock crevices during the day (UDWR 2010b). Little is known of the local distribution of this species.

Photo 3-58 Bird Cover and Forage: Brittlebrush in Seed

Big Free-tailed Bat

The big free-tailed bat (*Nyctinomops macrotis*) is rare in Utah, occurring primarily in the southern half of the state. It prefers rocky and woodland habitats and roosts in caves, mines, old buildings, and rock crevices. Big free-tailed bats eat insects, primarily moths. Females may give birth to a single offspring during late spring or early summer each year (UDWR 2010b). This bat has been observed in the NCA, but population numbers or trends are unknown.

Fringed Myotis

The fringed myotis (*Myotis thysandes*) is a small brown bat that occurs in most of the western United States, but is not common in Utah. It lives in caves and mines in colonies of several hundred individuals. Females generally give birth to a single offspring during the summer. Beetles are the major prey animal of the

Photo 3-59 Bird Cover and Forage: Squaw Bush with Immature Fruit

Squaw Bush

Rhus trilobata provides both food and shelter for many upland game birds, songbirds, and small and large mammals. It is of special value to native bees, which nest beneath, within, or harvest parts of the plant to construct their nests. (Wildflower Center 2015)

Townsend's Big-eared Bat

Corynorhinus townsendii emerge an hour after sunset to feed through the night. They will hunt alone or in small groups, preying on a variety of insects. Accomplished fliers, they can be swift and agile or slow and hovering.

Photo 3-60 Kit Fox, Utah BLM Sensitive Species

fringed myotis. The species is nocturnal, and individuals hibernate during the cold winter months (UDWR 2010b). The fringed myotis has been sighted in the NCA, but population numbers or trends are unknown.

Kit Fox

The kit fox (*Vulpes macrotis*) is known to occur in the NCA (Photo 3-60) where it has been observed to den with desert tortoise. Its prey base includes small mammals (primarily rabbits and hares), birds, invertebrates, and plant matter. It is mainly nocturnal, but individuals may be found outside of their dens during the day. The kit fox can be distinguished from other Utah foxes because of the black tip on its tail (red fox tails are tipped in white) and the lack of a median black stripe along the length of the tail, as is found on the common gray fox (UDWR 2010b). Population trends or numbers of kit fox in the NCA are unknown.

Spotted Bat

The spotted bat (*Euderma maculatum*) occurs state-wide in Utah, but has probably never been abundant in any particular location. Spotted bats are found in various habitats, from desert to montane coniferous stands. It is likely that some spotted bats migrate south for the winter, or to lower elevation locations (Snow 1974). Poche (1981) found that spotted bats in Washington County hibernated when temperatures fell too low for activity. When hibernating, spotted bats arouse easily, making them vulnerable to outside disturbances (Poche 1981). The Beaver Dam Wash offers the best opportunities for spotted bats within the NCA, but its presence in the NCA has yet to be confirmed.

Townsend's Big-eared Bat

Townsend's big-eared bat (*Corynorhinus townsendii*) (Photo 3-61) can occur in many types of habitat, but the species is often found near forested areas. Caves and mines are frequently used for day roosting and winter hibernation. Consequently, human disturbances of caves and the closures of abandoned mines may constitute threats to the species. Females congregate into nursery colonies and typically give birth to one offspring each year. Townsend's big-eared bats eat flying insects, particularly moths,

Photo 3-61 Townsend's Big-eared Bat, Utah BLM Sensitive Species

Photo 3-62 Desert Iguana, Utah BLM Sensitive Species

and individuals are often seen foraging near trees. The species is nocturnal, and individuals typically do not leave their roosts until well after sunset (UDWR 2010b). Habitat for this bat is available in the Beaver Dam Mountains in the NCA and along Beaver Dam Wash.

Western Red Bat

The western red bat (*Lasiurus blossevillii*) is extremely rare in Utah, being known from only a few locations in the state. Western red bats are normally found near water, often in wooded areas. Some individuals may hibernate during cold times of the year, but most members of the species migrate south to warmer climates for the winter. This species is nocturnal and daytime roosting usually occurs in trees. Females may give birth to one litter of two to four offspring during late spring. Western red bats eat insects, often foraging near riparian areas (UDWR 2010b). The area around the Welcome Spring complex in the NCA offers the best opportunities for western red bats to be found in the NCA; population trends or numbers are currently unknown.

3.11.2.6 Reptiles

Common Chuckwalla

Common Chuckwallas (*Sauromalus ater*) (Photo 3-63) are predominantly found near cliffs, boulders, or rocky slopes, where they use rocks as basking sites and rock crevices for shelter. Chuckwallas are primarily herbivorous, although insects are also consumed. Female chuckwallas lay one clutch of 5-15 eggs during the summer months. Chuckwallas are fairly large lizards, sometimes reaching over eight inches in length, not including the tail (UDWR 2010b). Chuckwalla are present in the NCA, but population trends or numbers are not known.

Desert Iguana

Desert iguanas (*Dipsosaurus dorsalis*) (Photo 3-62) are pale gray with brown patches or bars on their sides, long tails, and a row of raised (keeled) scales running down the ridge of their backs (UDWR 2010b). Their preferred habitat is the creosote bush-bursage community. This species is primarily a plant eater, feeding preferentially on the creosote bush, but is also known to eat insects and carrion. They are tolerant of extremely

Photo 3-63 Common Chuckwalla, Utah BLM Sensitive Species

Desert Iguana

Dipsosaurus dorsalis are fast runners and will sometimes run bipedally, or on their hind legs only.

high temperatures and remain active in hot weather, although at times they may seek shelter in rodent burrows. Females lay a clutch of 3-8 eggs during the summer. Desert iguanas are present in the NCA; however, population trends and numbers are unknown.

Desert Night Lizard

The desert night lizard (*Xantusia vigilis*) is a slim lizard with olive, gray, or brown coloration, and black speckled markings on its back. Individuals often have a light-colored stripe edged with black that runs from eye to shoulder (UDWR 2010b). This lizard breeds in May and June and females give birth to live young (usually one to three at a time) in late summer or early fall. The desert night lizard eats a variety of insects and other small invertebrates. This species is present in the NCA, but population trends or numbers are not known.

Gila Monster

Gila monsters (*Heloderma suspectum*) are large stocky lizards with short thick tails and large heads. The scales on the backs of these lizards resemble a beadwork pattern of black, orange, pink, and yellow. Their preferred habitats are large rocky shelves, sandy areas, and creosote-bursage vegetation (UDWR 2010). Gila monsters are most active during the spring and summer months, although they do spend about 95% of the active season in burrows or under rocks (WildEarth Guardians and Beck 2010). Females typically lay one clutch of 1-12 eggs during mid-summer. The diet of the Gila monster is composed of eggs (of ground nesting birds, lizards, and snakes), small mammals, lizards, and insects (UDWR 201). The Beaver Dam Mountains, Bulldog Canyon, and areas adjacent to the Welcome Springs complex have the highest likelihood of supporting populations of these reptiles. Within the NCA, population trends and numbers for Gila monsters are currently unknown.

Photo 3-64 Mojave Rattlesnake, Utah BLM Sensitive Species

Mojave Rattlesnake

The Mojave rattlesnake (*Crotalus scutulatus*) (Photo 3-64) is greenish, brownish, or yellowish in color, with well-defined darker colored patches of diamonds, ovals, or hexagons running down its back (UDWR 2010b). The species is primarily nocturnal to avoid the heat of the day, and consumes a variety of small mammals (such as kangaroo rats, rabbits, and mice), as well as lizards and occasionally other snakes. Females are live-bearing, giving birth to as many as seventeen offspring during late summer. The NCA provides the desert scrub habitat preferred by Mojave rattlesnake; these snakes are present in the NCA, but population trends or numbers are not known.

Sidewinder

Sidewinders (*Crotalus cerastes*) are venomous snakes that can be easily identified by their characteristic side-winding, s-shaped motion. They are generally light-colored, with slightly darker spotting patterns of tan, gray, or yellow (UDWR 2010b). Sidewinders prefer sandy open terrain. They are mainly nocturnal, avoiding the extreme heat of the day, and are also inactive during cold weather. When inactive, sidewinders take refuge in the burrows of tortoises or small mammals. Females give birth to 5-18 live young during the fall. Sidewinders eat small mammals (such as kangaroo rats and pocket mice) and lizards; birds and snakes are also occasionally consumed. Sidewinders subdue their prey by injecting venom through large fangs located at the front of the upper jaw. This species is known to occur in the NCA but specifics on population trends or numbers are not known.

Southwestern Speckled Rattlesnake

Crotalus mitchellii pyrrhus is a venomous pit viper usually found in rocky, boulder strewn areas. They are primarily nocturnal, but can be active at dawn and dusk during periods of high daytime heat. They may also be active during the day when the temperature is more moderate. Speckled rattlesnakes are ambush hunters, feeding on small mammals, lizards, and birds. (California Herps 2014)

Photo 3-65 Western Banded Gecko, Utah BLM Sensitive Species

Speckled Rattlesnake

Rocky desert areas are the preferred habitat of this snake, whose prey base includes lizards, birds, and small mammals (UDWR 2010b). The speckled rattlesnake (*Crotalus mitchellii*) is active from April to October; during the winter months it hibernates in dens, often with other rattlesnakes. Females give birth to live young during the late summer or early fall. Speckled rattlesnakes are present in the NCA, but population trends or numbers are not known.

Western Banded Gecko

The western banded gecko (*Coleonyx variegates*) (Photo 3-65) eats small invertebrates, primarily insects and spiders. Females may lay several clutches of eggs each year during the spring and summer. The average clutch size is two eggs, and eggs hatch in about six weeks. Western banded geckos are excellent climbers that can be found in many types of habitat. Members of the species are nocturnal and become inactive during the day, as well as during the very cold and very hot times of the year (UDWR 2010b). Western banded geckos are present in the NCA (Utah Natural Heritage Program 2011). Specific population trends or numbers are not known.

Western Thread-snake

The western thread-snake (*Leptotyphlops humilis*) is a secretive burrowing species, often living in moist loose soil. Because the species spends so much time under the ground, the western thread-snake's eyes are vestigial. It eats small invertebrates, such as spiders, insects, and centipedes, and insect larvae. Females lay a clutch of 2-6 eggs in later summer, and then stay with the eggs until after hatching. The species is nocturnal—individuals are only active on the surface at night (UDWR 2010b). Western thread-snakes are present in the NCA (Utah Natural Heritage Program 2011), but population trends or numbers are not known.

Zebra-Tailed Lizard

Zebra-tailed lizards (*Callisaurus draconoides*) typically have grayish backs, yellow colored sides, and long slender legs that are well suited for running at high speeds (UDWR 2010b). This species prefers sparsely vegetated desert areas with hard packed soils. Their diet consists of insects, spiders, lizards, and occasionally plants. Females lay one to five

Western Banded Gecko

Coleonyx variegates will wave its tail at a predator in order to divert attention away from its head and body. The tail will break off easily and continue to wiggle, distracting the predator so the gecko can escape. While the tail will rapidly regrow, it now lacks the structures that first enabled it to break off. (Arizona-Sonoran Desert Museum 2015)

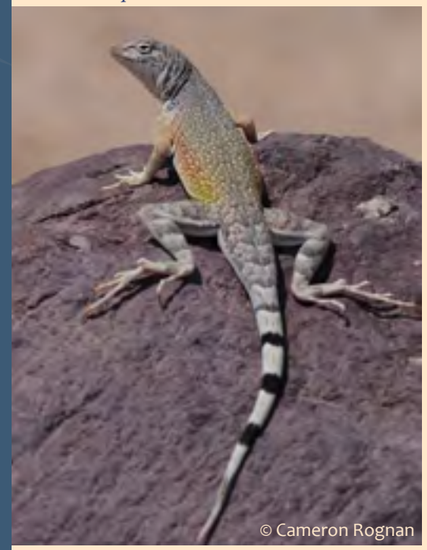
clutches of 4-5 eggs each year, with more clutches laid in the southern portions of the species' range. Zebra-tailed lizards (Photo 3-66) are present in the NCA (Utah Natural Heritage Program 2011), but population trends or numbers are not known.

3.11.2.7 Amphibians

Arizona Toad

This species inhabits streams, washes, irrigated crop lands, reservoirs, and uplands adjacent to water. It is inactive in cold weather, and, while the newly metamorphosed young are active during daylight hours, the adults are mainly nocturnal. The Arizona toad (*Bufo microscaphus*) lays eggs on the bottoms of shallow, slow-moving streams. The diet of adults consists mainly of insects and snails, whereas larvae (tadpoles) consume plant matter and organic debris. Adults are typically 2-3.25 inches long, and range in color from greenish gray to brown, with a light-colored stripe across the head (UDWR 2010b). Arizona toad can be found near wetlands and seeps, such as Welcome Spring and Lytle ranch. Population trends or numbers are not known.

Photo 3-66 Zebra-Tailed Lizard, Utah BLM Sensitive Species



Zebra-tailed Lizard

It's difficult to get a good look at *Callisaurus draconoides* as it is a fast runner and doesn't hestitate to bolt at the slightest movement. Catch it basking on rocks, even in the hottest part of the day.

3.12 OTHER FISH AND WILDLIFE SPECIES

Public lands provide habitats for migratory birds, upland game birds and waterfowl, as well as sport fish and large and small game species. In cooperation with UDWR, USFWS, and wildlife advocacy groups, BLM manages habitats and fisheries to maintain or increase population numbers and to reestablish populations of native species that were historically present. Wildlife habitat needs vary significantly by species. It is generally true that healthy and sustainable wildlife populations can be supported where there is a diverse mix of vegetation communities to supply structure, forage, cover, and other specific habitat requirements.

Photo 3-67 Wildlife Catchment (Artificial Water Source), Beaver Dam Wash NCA

3.12.1 Ungulate Species

3.12.1.1 Desert Bighorn Sheep

The desert bighorn (*Ovis canadensis nelsoni*) is a subspecies of bighorn sheep that are found in seven states across the desert southwest. These sheep are well adapted to the extremes of desert heat and cold, and prefer rocky, mountainous terrain. Declining numbers of desert bighorns have prompted state wildlife agencies to aggressively strive to increase populations in suitable habitats.

In 1985, UDWR began bighorn sheep reintroductions in the Beaver Dam Mountains and the Utah portion of the Beaver Dam Mountains Wilderness, transplanting 25 sheep. One requirement for the reintroductions was the elimination of domestic sheep and goats grazing on the public land allotments within a 9 mile radius of the reintroduction area, to prevent the spread of diseases to the wild bighorn populations (UDWR 2008).

The NCA contains approximately 8,600 acres that are suitable as year-long crucial habitat for bighorn sheep (Map 3-15). This is only a small portion of the total herd management unit, which extends east and north of the NCA. The current population of this herd is estimated to be 60 animals, less than half of UDWR's minimum population viability estimate, but appears to be stable. Applications for bighorn sheep hunting licenses greatly exceed the availability of permits issued by UDWR. Public demand for bighorn sheep viewing and wildlife photography locations is also high (UDWR 2008).

Public lands provide crucial habitat for bighorn sheep herds, and can be prime locations for the construction of bighorn sheep-specific water developments. In designated wilderness, such as the Beaver Dam Mountains Wilderness of Utah and Arizona, and within the NCA, management of the public lands emphasizes conservation, protection, and enhancement of natural resources; this emphasis serves to protect bighorn sheep populations and habitats from threats related to OHV recreation uses, energy development projects, mining, and land disposals. Big and small game habitat improvements, transplants, big game surveys, special status species surveys and coordination, and the maintenance of a special status species database are only a few of the management practices that have been implemented in the NCA.

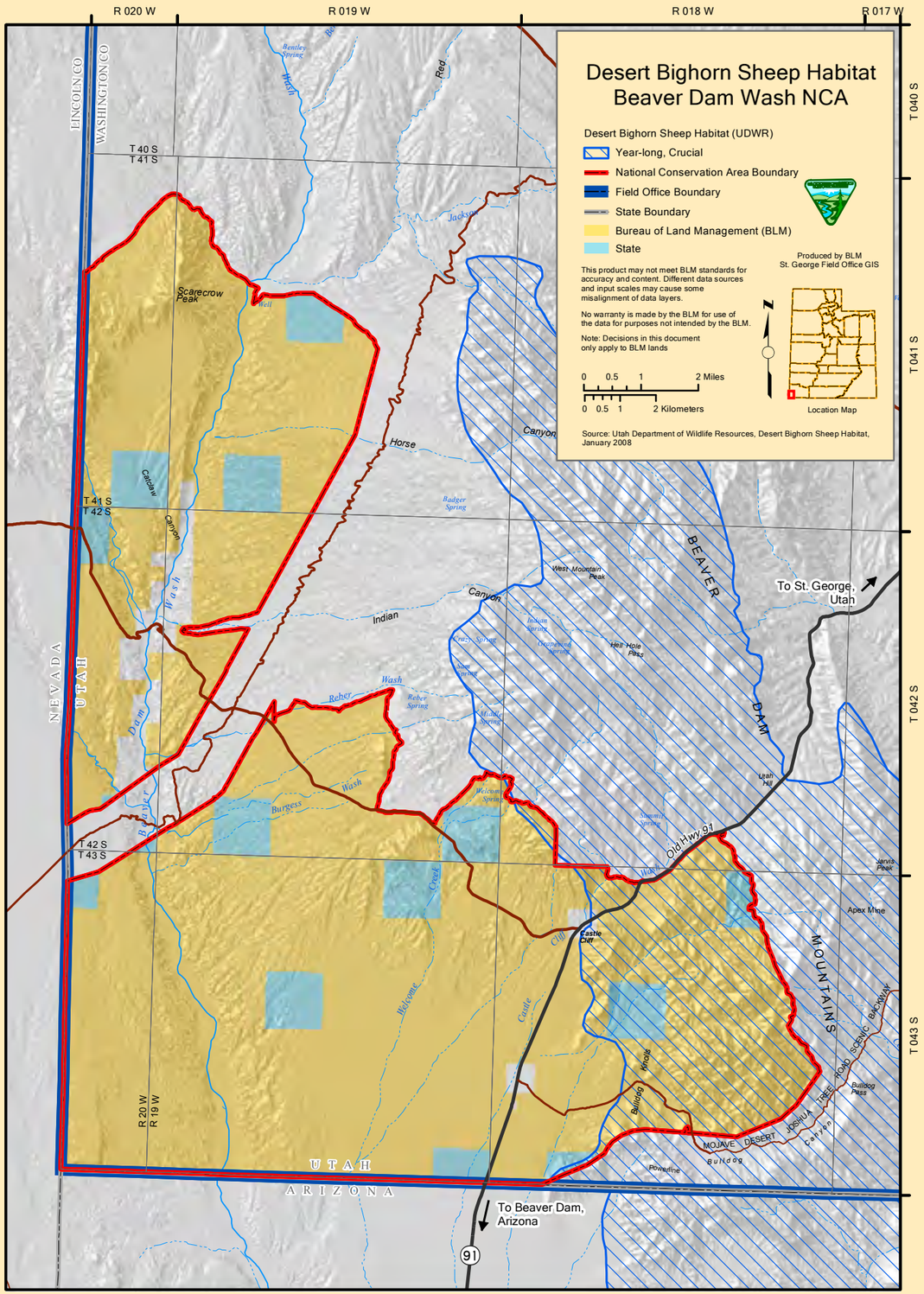
3.12.1.2 Mule Deer

UDWR has divided Washington County into two large Deer Herd Units, one of which, the Pine Valley Herd Unit (#30) encompasses all areas northwest of I-15 and includes all of the Beaver Dam Wash NCA and most of the Red Cliffs NCA (UDWR 2012).

The mule deer (*Odocoileus hemionus*) population targets from UDWR's current management plan for this herd unit have been reduced by 20%, reflecting habitat impairment from drought as well as the large scale wildfires that have burned so much of the western third of Washington County. Habitat condition for the entire Pine Valley Herd Unit is currently classified by UDWR as "fair", based on data collected from 22 vegetation transects conducted in 2013 (Jason Nicholls, UDWR, pers. comm. to Dave Corry, September 2013).

The current UDWR estimate of the deer population in the Pine Valley Herd Unit is approximately 13,000 deer. The number of mule deer that utilize the NCA would be a small fraction of that estimate, as the majority of the deer herds are on public lands to the north and west of the NCA. The NCA encompasses approximately 2,737 acres of crucial winter habitat and 115 acres of crucial summer fawning habitat (Map 3-16). A number of artificial water sources have been developed within and near the NCA that enhance mule deer habitat (Photo 3-67).

"Public lands provide crucial habitat for bighorn sheep herds."



Desert Bighorn Sheep Habitat
Beaver Dam Wash NCA

Desert Bighorn Sheep Habitat (UDWR)
- Year-long, Crucial
- National Conservation Area Boundary
- Field Office Boundary
- State Boundary
- Bureau of Land Management (BLM)
- State

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Note: Decisions in this document only apply to BLM lands

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Produced by BLM
St. George Field Office GIS

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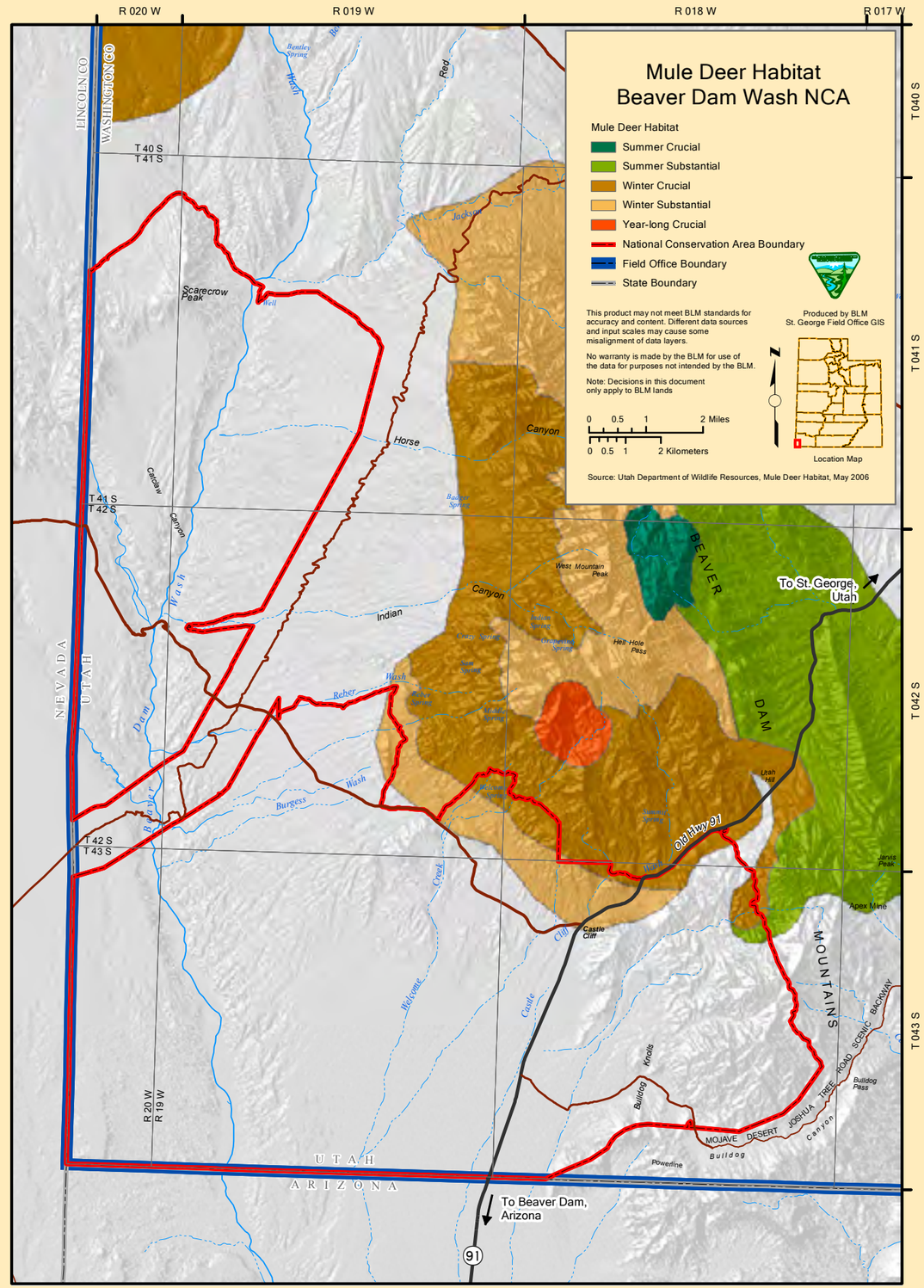
Location Map

Source: Utah Department of Wildlife Resources, Desert Bighorn Sheep Habitat, January 2008



Mule Deer Habitat
Beaver Dam Wash NCA

Mule Deer Habitat
- Summer Crucial
- Summer Substantial
- Winter Crucial
- Winter Substantial
- Year-long Crucial
- National Conservation Area Boundary
- Field Office Boundary
- State Boundary

This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.

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Note: Decisions in this document only apply to BLM lands

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0 0.5 1 2 Kilometers

Produced by BLM
St. George Field Office GIS

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Location Map

Source: Utah Department of Wildlife Resources, Mule Deer Habitat, May 2006

3.12.2 Other Mammals

3.12.2.1 Mountain Lion

Mountain lion (*Puma concolor*) are likely to be present in the NCA, although precise population numbers for this area are currently unavailable. These large predators typically occur in low densities and have large home ranges, 54 square miles for females and over 100 square miles for males. They are active year-round, and target mule deer, as well as other small and medium sized mammals, as prey. Males are solitary except during brief breeding periods lasting about a week. UDWR issues hunting permits for mountain lion in the NCA. The number of permits issued is based, in part, on mule deer and bighorn sheep population estimates.

3.12.2.2 Coyote

Coyotes (*Canis latrans*) are found throughout Washington County and have been regularly observed in the NCA. These mid-sized omnivores consume rodents, rabbits, eggs, tortoises, carrion, insects, and fruit. The availability of food appears to influence the home range and social organizations of this very adaptable species.

3.12.3 Upland Game Birds

3.12.3.1 Gambel's Quail

Nearly 95% of the NCA has been identified by UDWR as crucial year-round habitat for Gambel's quail (*Cailipepla gambelii*) . This species once had a wider range within Utah, but is currently limited to Washington County. Food sources include filaree (*Erodium cicutarium*) and a variety of seeds. Quail are a popular target for hunting. Quail Unlimited has worked with BLM to install a number of guzzlers for quail within the NCA, including locations in Bulldog Canyon and lower Welcome Spring Wash. Quail also make use of overflow from cattle tanks, along with the natural water sources available at Welcome Spring and on the private land at Lytle Ranch. Population trends and numbers are not known, although anecdotal information suggests that the population is robust.

3.12.3.2 Mourning Dove

Mourning doves (*Zenaida macroura*) (Photo 3-68) are common year-round residents of the NCA, and one of the preferred upland game birds for hunters. These small light gray or brownish doves form monogamous pairs and may produce as many as six broods each year.

3.12.4 Amphibians

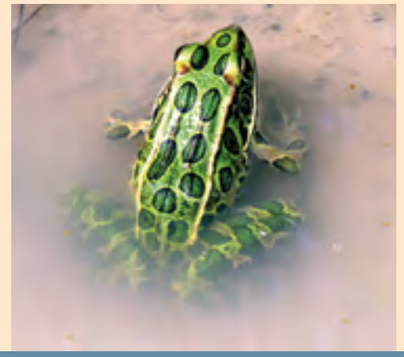
3.12.4.1 Northern Leopard Frog

Northern leopard frogs (*Rana pipiens*) (Photo 3-69) have been observed just outside the NCA at Jackson Well (Utah Natural Heritage Program 2011). The species was formerly widespread throughout the West but its numbers have declined due to habitat loss and mortalities linked to chytrid fungus (USFWS 2014). In 2009, environmental groups petitioned USFWS and requested that the species be considered for listing under the ESA (USFWS 2009). In 2011, USFWS determined that listing was not warranted (USFWS 2011).

Photo 3-68 Mourning Dove

© Cameron Rognan

Photo 3-69 Northern Leopard Frog



Mountain Lion (Cougar)

Puma concolor is a solitary feline, avoiding other cats unless seeking a mate. They are equally shy of humans and are rarely seen. Mountain lions can travel large distances in search of food, and hunt at night or in the twilight hours of dawn or dusk.

3.13 HERITAGE RESOURCES

Conservation, protection, and enhancement of cultural and historical resources (collectively referred to here as "heritage resources") were identified as one of the purposes for the Congressional designation of the NCA, through OPLMA. These resources are also protected under many other federal historic preservation laws, most notably ARPA and the National Historic Preservation Act (NHPA), and federal regulations that implement these laws.

Heritage resources include the physical remains of past human activities that provide tangible evidence of, and scientific information about past cultures and time periods. By definition, the physical remains can include pottery (Photo 3-70), basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, pit houses, rock paintings and carvings, intaglios, or graves. Under the definitions included in ARPA, the term "archaeological resource" refers to any material remains of human life or activities that are at least 100 years old, and that may be of archaeological interest, as further defined at 43CFR7.3.

Heritage resources have also been more broadly defined to include areas where significant events occurred (although evidence of the event may no longer remain) and places that may be of traditional cultural importance or religious significance to human societies. In these contexts, natural landscapes with particular cultural importance are also included within the definition of cultural resources and generally called Traditional Cultural Properties (TCPs).

Cultural landscapes are another concept of heritage resources, derived from the notion that human societies have always been intrinsically anchored to the land, that their relationship and knowledge of the land is shared among them today, and that it is transferred over generations. The imagery of the land that is held by a people is seen as being a result of their past experiences with the land and other cultural perspectives of the people themselves. Some also have ties to natural features, hunting and plant collecting areas, campsites, rock art, and other areas that they consider sacred.

Photo 3-70 Virgin Anasazi Corrugated Pot

3.13.1 Cultural History Overview

The following summarizes the broad expanse of human history in southwestern Utah, divided into a series of developmental stages or "phases" that are determined by changing technologies or socioeconomic systems. For more detailed descriptions of regional cultural history, the reader is referred to other published sources (e.g. (Talbot and Richens 2009, Altschul and Fairley 1989).

3.13.1.1 Paleo-Indian (15000-7000 B.C.)

Few archaeological sites or artifacts from this earliest period of human occupation in North America have, to date, been discovered in southwestern Utah. Elsewhere, Paleo-Indian groups were present prior to 15000 B.C. and engaged in a distinctive "big game" hunting lifestyle that spanned the Late Pleistocene and early Holocene.

3.13.1.2 Archaic (7000-300 B.C.)

Throughout the long expanse of this phase, aboriginal groups adapted to periods of climatic variability and to the extinction of Late Pleistocene megafauna through changes in their subsistence

Northern Leopard Frog

Rana pipiens is named for the dark colored spots on its back and legs. If you did frog dissections in high school back in the 1970s, it was probably a northern leopard frog. This species was once abundant, but since the 1970s populations have declined. Declines are probably a combination of ecological factors (and not just because of dissections). (National Geographic 2014)

"By A.D. 500, many aboriginal groups had adopted the fundamental attributes that define the Formative phase: cultivation of maize and other domesticated crops, permanent habitation sites, ceramic production, and the use of bow and arrow technology."

strategies and technologies. Many researchers divide the Archaic into three distinct intervals, the Early, Middle, and Late Archaic, defining the intervals by diagnostic projectile point types.

During the Early Archaic, climate change toward drier conditions appears to have encouraged human groups to adopt a highly generalized mobile hunting and gathering strategy. Artifact assemblages shifted to include more digging tools, grinding stones, and basketry for plant processing and storage. Hunting implements diversified to include snares and small projective points, signaling that small mammals were now an important food source. Dart points, propelled by a wooden throwing device called an atlatl, improved the success of hunters.

The Middle Archaic appears to have been a period of slight cooling and more effective annual precipitation, factors that may have contributed to population increases. Subsistence strategies continued to focus on a generalized hunting and plant collection strategy, with some groups moving into higher elevation zones to exploit pinyon pine nuts, Indian ricegrass, and mule deer.

These trends accelerated in the Late Archaic, when the regional climate became significantly cooler and wetter. This period appears to have supported higher population numbers based on the number of sites that have been dated to the Late Archaic period. Archeological evidence from this period suggests that many groups were exploiting lowland and upland zone resources.

A small number of Middle and Late Archaic period sites have been archaeologically excavated in the designated utility corridor that bisects the NCA but is outside of its boundaries. The data recovery was conducted as mitigation for impacts associated with the installation of one of the first major interstate power transmission lines in the early 1970s (Moffitt, Rayl and Metcalf 1978). The excavated sites contained evidence of habitation structures, small roasting features, grinding slabs, milling stones, storage cists, and basketry fragments. Botanical and faunal materials that were recovered indicated that the Archaic inhabitants of these sites collected native seeds and pinyon pine nuts, and hunted small and medium-sized wild game including rabbits, mule deer, and desert bighorn sheep (ibid).

3.13.1.3 Formative (700 B.C.-approximately A.D. 1250)

This cultural phase was preceded by a transition that began around 300 B.C., during which mobile hunting and gathering subsistence strategies were gradually replaced by highly variable degrees of reliance on cultivated plants, such as maize, beans, and squash (Allison 1990, 2000). Most researchers subdivide the Formative Period into five temporal phases: Baseketmaker II, Basketmaker III, Pueblo I, Pueblo II, and Pueblo III (Altschul and Fairley 1989). By A.D. 500, however, many aboriginal groups (labeled "Ancestral Puebloans", or "Virgin (Branch) Anasazi" locally) had adopted the fundamental attributes that define the Formative phase: cultivation of maize and other domesticated crops (Figure 3-2), permanent habitation sites, ceramic production, and the use of bow and arrow technology.

Figure 3-2 Formative Stage Horticulture

The initial phase, Basketmaker II, has been dated as beginning around 300 B.C., when small-scale horticulture first appears on the Colorado Plateau but prior to the development of ceramics and sedentary villages. Bell-shaped storage cists and large circular pit houses were constructed in small habitation sites, and coiled baskets, fiber and hide containers, snares, and nets typify the artifact assemblages from this phase.

The Basketmaker III phase is characterized by the longer term occupation of habitation sites and greater reliance on horticulture. Typical habitation sites of this period in southwestern Utah included one to five circular pithouses and several storage cists (Dalley and McFadden 1985). The bow and arrow, two-handed manos and trough metates, and plain gray sand-tempered pottery occasionally decorated with black painted designs all came into use during Basketmaker III times.

The Pueblo I phase, dating from about A.D. 800 to A.D. 1000, was characterized by larger and somewhat more formal pithouse villages, comprised of semi-subterranean structures for habitation and storage (Dalley and McFadden 1985). Ceramic production also appears to have increased during this period.

A large number of Pueblo II sites are preserved in southwestern Utah, suggesting that human populations may have increased during this period. Habitation sites were located in upland areas and along all the major stream channels where arable lands would have supported dry farming, native plant collection, and hunting. Many archaeologists believe that subsistence strategies during this time varied along a continuum from full-time sedentary horticulturalists to full-time mobile hunters and collectors (Lyneis 1995, 1996). Site types reflect this continuum, ranging from large farmsteads near permanent water sources that were occupied year-round, to rock shelters and open activity sites in upland zones used only for seasonal hunting and collecting. Some of the Ancestral Puebloan groups appear to have been more reliant on cultivated crops than other contemporary groups.

Few sites dating to the Pueblo III phase (A.D. 1150-ca. 1300) have, to date, been identified in southwestern Utah. Archaeologists believe that climate change (prolonged periods of drought, followed by catastrophic flooding events along the Virgin River and its tributaries) made irrigation-based horticulture and dry land farming unsustainable in the arid lands of Washington County. The paucity of Pueblo III sites has led most researchers to conclude that the Ancestral Puebloan horticulturalists had abandoned

"Archaeologists believe that climate change made irrigation-based horticulture and dry land farming unsustainable in the arid lands of Washington County."

"In 1826, American fur trapper and explorer Jedediah Smith traveled through Washington County and the Virgin River Gorge seeking a route to California from northern Utah."

southwestern Utah and adjacent areas of southern Nevada and northwestern Arizona. The material culture that identified the Formative horticulturalists disappears from the archaeological record of southwestern Utah by the late 13th century.

Alternatively, the Ancestral Puebloans may have remained in southwestern Utah while adopting a mobile hunting and gathering way of life similar to that of the Archaic Period, thereby leaving less evidence of their presence in the archaeological record. As the Numic-speaking, hunting and gathering Southern Paiute bands were also living in this region by at least the 10th century, it is unclear whether resource competition may also have been a causal factor in the abandonment of the region by the Ancestral Puebloan horticulturalists.

3.13.1.4 Late Prehistoric Period (A.D. 1250-1500)

Artifacts and sites of this period reflect the occupations of the Southern Paiute, who traveled in extended family groups in a seasonal round of hunting and seed/plant collection. Seasonal movements would begin in the spring at lower elevations as plant and animal foods became available, and continued throughout the year at higher elevations. Family groups would aggregate into larger bands for early fall pine nut harvests, communal rabbit drives, and big game hunts. Following these communal activities, smaller extended family units would travel to winter base camps, caching surplus foods in protected locations.

The material culture of the Numic-speakers reflected the mobility of their ways of life. Temporary brush shelters and wind breaks provided refuge, as did caves and rock alcoves. Baskets were used as headgear, containers, and cooking vessels, although some ceramic vessels were constructed and used for cooking and storage. Groundstone and other non-portable items were cached at favored collection areas for annual reuse.

In southwestern Utah, the Southern Paiute also relied on small-scale horticulture, growing corn, squash, melons, and sunflowers in fields along the Virgin River, Santa Clara River, Beaver Dam Wash, and other tributaries of the Virgin River. They constructed extensive dam and ditch irrigation systems to divert water to their fields. Each spring, the Southern Paiute planted their fields and left them in the care of a few members of their extended family groups. While the crops grew, the remainder of the family could hunt game and collect seasonally ripening native seeds and nuts in upland areas of their traditional homeland.

3.13.1.5 Proto-Historic Period (A.D. 1500-1850)

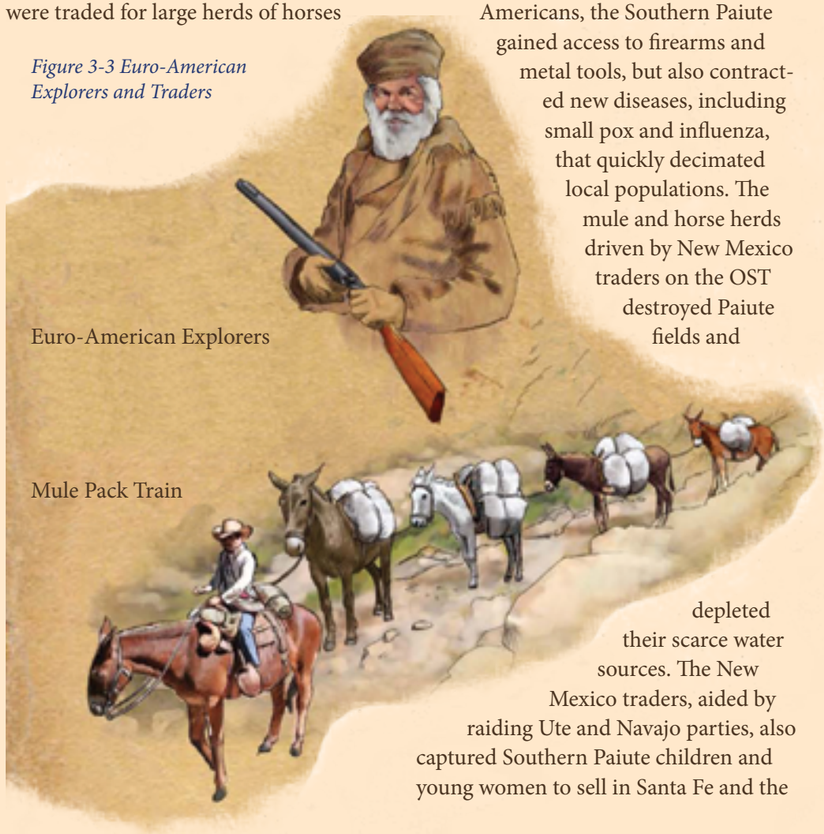
The Proto-Historic Period began about A.D. 1500 when local groups were being indirectly influenced through trade and exchange with the Spanish Colonial settlements in Mexico and California. The first well-documented direct contact between the Southern Paiute of southwestern Utah and Euro-Americans appears to have occurred during the single exploratory trek of two Franciscan friars in 1776. Friars Dominguez and Escalante attempted to find a route from Santa Fe, New Mexico to Monterrey, California, and traveled into Washington County on their return journey.

Other Euro-Americans (Figure 3-3) continued to follow the path pioneered by Dominquez and Escalante. In 1826, American fur trapper and explorer Jedediah Smith traveled through Washington County and the Virgin River Gorge seeking a route to California from northern Utah (Alder and Brooks 1996). On a second trip in 1827, Smith avoided the difficult route through the Gorge by traveling up the Santa Clara River, crossing over Utah Hill to the Beaver Dam Wash which he followed south to its confluence with the Virgin River. Smith

observed the Southern Paiute living along the Santa Clara River and Beaver Dam Wash with cultivated fields of corn, sunflowers, and squash.

By 1829, a long distance pack trail system had been pioneered by New Mexicans between the trade centers of Taos and Santa Fe to the Spanish missions in California. In Washington County, the primary trail followed the Santa Clara River south from Mountain Meadows to Camp Springs, diverted west over Utah Hill and south to the Virgin River, near Beaver Dam, Arizona. From 1829 until about 1850, mule pack trains carried New Mexico woolen goods to California along this long distance pack trail that was labeled by John C. Fremont as the "Old Spanish Trail." (Information on the OST and its Congressional designation as a National Historic Trail is presented in section 3.14.2). In California, these goods were traded for large herds of horses and mules that were driven back to Santa Fe for sale.

Figure 3-3 Euro-American Explorers and Traders



Various Southern Paiute bands were present in southern Utah in the 17th and 18th centuries when the first Anglo-Europeans began to explore and settle the Intermountain West and Great Basin. Linguistic evidence suggests that the Southern Paiute had moved into the western Great Basin from a homeland in north-central California by the 10th century. By 1776, when Dominguez and Escalante came into contact with the Southern Paiute during their journey of exploration through the region, Paiute bands had established a new homeland in southern Utah. Many other early explorers noted the settled villages and cultivated fields of the Southern Paiute along the Virgin River and its major tributaries, particularly the Santa Clara River. Through their contacts with the Euro-Americans, the Southern Paiute gained access to firearms and metal tools, but also contracted new diseases, including small pox and influenza, that quickly decimated local populations. The mule and horse herds driven by New Mexico traders on the OST destroyed Paiute fields and depleted their scarce water sources. The New Mexico traders, aided by raiding Ute and Navajo parties, also captured Southern Paiute children and young women to sell in Santa Fe and the

"I wanted to be the first to view a country on which the eyes of a white man had never gazed and to follow the course of rivers that run through a new land."
–Jedidiah Smith, American Explorer, 1799–1831

California mission settlements. All of these factors contributed to declines in Paiute numbers and displacement of family groups from their traditional hunting and resource collection areas.

3.13.1.6 Historic Period (A.D. 1852-Present Day)

The first permanent settlement of Washington County by Euro-Americans was directed by the leadership of the Church of Jesus Christ of Latter Saints (a.k.a. Mormons) as part of a wide-ranging colonization strategy for the self-proclaimed "State of Deseret". In 1847, the first groups of Mormon immigrants had settled in the valley of the Great Salt Lake. During subsequent decades, thousands of Mormon converts came to Utah under Church-sponsored programs. Church leadership focused on establishing settlements between Salt Lake City, Utah and San Bernardino, California to create a "Mormon Corridor to the Pacific" that would control access along the major travel routes and facilitate both trade and immigration.

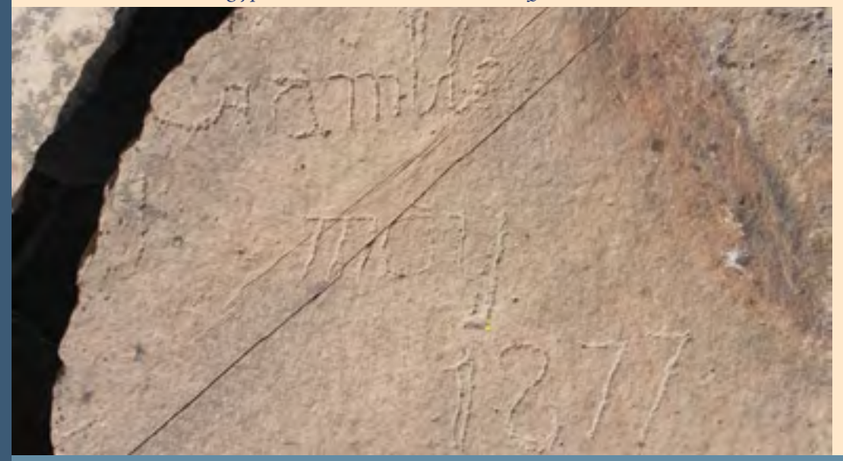
Settlement of the Southern Indian Mission in 1852 and the Santa Clara Mission in 1854 initiated Mormon colonization in today's Washington County. They established agricultural communities along the Virgin River, its major tributaries, and primary travel routes (including the OST). A majority of the permanent settlements were along the same river and stream channels where the Southern Paiute had historically cultivated their crops. The Southern Paiute were displaced to marginal farming areas; many returned to a more generalized hunting and wild food collection strategy when they no longer had access to perennial water sources for crop production. After the initial settlement period, local communities were sustained by the cultivation of crops and livestock production. The public rangelands of Washington County provided the land base for livestock grazing operations.

"The first permanent settlement of Washington County by Euro-Americans was directed by the leadership of the Church of Jesus Christ of Latter Saints as part of a wide-ranging colonization strategy for the self-proclaimed State of Deseret."

3.13.2 Identification of Heritage Resources in the NCA

Compliance with the NHPA requires that federal agencies take into account the potential effects of their projects, activities, and programs on heritage resources listed, or eligible for listing, on the NRHP. To satisfy this legal requirement, heritage resources must be identified through literature reviews, consultations with American Indian Tribes, the State Historic Preservation Officer, other knowledgeable parties, and through field investigations by qualified archaeologists, historians, ethnographers, or other researchers with specialized expertise.

Photo 3-71 Name Petroglyph on Sandstone ca. 1877, Red Cliffs NCA



During field investigations, heritage resources are documented and evaluated for eligibility for listing on the NRHP. Consultations with the UTSHPO confirm the eligibility determinations and assessment of project effect on NRHP-listed or eligible properties (aka "historic properties") that are made by BLM for each heritage resource. When project-related adverse effects to historic properties cannot be avoided, they are mitigated to the extent possible through agreed-upon "treatments," such as archaeological excavations conducted under a research design to recover important scientific data from a site, which are developed in consultation with UTSHPO, Tribes, and other interested parties.

Class I inventories are broad overviews of prior heritage resource research conducted within a BLM administrative area, and are often used by BLM to inform land use planning processes. The most recent Class I inventory for Washington County was completed in 1986 (Thompson and Thompson 1986); BLM is currently completing a new Class I overview for the Beaver Dam Wash and Red Cliffs NCAs.

To date, approximately 4,400 acres (7% of the land base) of the Beaver Dam Wash NCA have been intensively inventoried to identify and document heritage resources. Prior field investigations were conducted at Class II (statistically based sample) and Class III (systematic intensive) levels, as part of research studies and to fulfill NHPA compliance requirements for surface-disturbing projects (e.g., fence lines, post fire stabilization projects). More extensive Class III inventory efforts have been completed within the two designated utility corridors (Navajo-McCullough and the Intermountain Power Plant (IPP) corridors) that bound the NCA but are not within its land base. These field inventories and related archaeological data recovery projects were completed prior to the installation of major interstate power transmission lines and fiber-optic lines in these corridors, in compliance with the mandates of Section106 of the NHPA.

What these prior inventories have shown (Table 3-24) is that many of the heritage resources previously documented in the NCA date to the late 19th and early 20th century and are travel and transportation related. A detailed description of two early and important historic roads that traverse the NCA is presented below in sections 3.13.3 and 3.13.4.

"Compliance with the National Historic Preservation Act requires that federal agencies take into account the potential effects of their projects, activities, and programs on heritage resources listed, or eligible for listing, on the National Register of Historic Places."

Table 3-24 Historic Period Sites Recorded in the NCA

Site No. 42WS	Site Type	Oldest Date	Historic Theme	Architectural Features
5032	Old Mormon Road/ Old Southern Road	1850	Settlement/Territorial (1847-1896)	Stone Cribbing
5029	Arrowhead Trails Highway-Service Station	1917	Settlement Expansion (1896-1919)	Concrete and Rock Foundation, Concrete Pad, Concrete Blocks, Rock-Edged Earthen Platforms
5028	Trash Scatter	1930	Great Depression (1929-1939)	None
5030	Telephone Line	1928	Great Depression (1929-1939)	Wooden Utility Poles

"The first interstate automobile route through Utah crossed the NCA and was called the Arrowhead Trails Highway."

Figure 3-4 Arrowhead Trails Highway Map ca. 1930's (Automobile 1937)

3.13.3 Arrowhead Trails Highway

The first interstate automobile route through Utah crossed the NCA and was called the Arrowhead Trails Highway. First envisioned in 1914 by entrepreneurs in Las Vegas, Nevada to encourage automobile tourism in southern California, Nevada, and Utah, the Arrowhead Trail would cross three states and be promoted by the Automobile Club of Southern California and other touring clubs. These clubs published road maps and tour guides that described the road conditions and tourist attractions along the Arrowhead Trails Highway. By 1923, the Lincoln Highway Association map showed it as the primary auto road between Salt Lake City, Utah and Los Angeles, California. In Washington County, Utah, the Arrowhead Trails Highway traveled on the Beaver Dam Slope, through the Beaver Dam Mountains, across the Shivwits Reservation, and followed the Santa Clara River south to Santa Clara and St. George (Figure 3-4).

Boosters of the new highway, including renowned race car driver Charles Bigelow, solicited support from politicians, government officials, and local communities from Salt Lake, Utah to Los Angeles, California. At first, local communities and private businesses were primarily responsible for improvements to existing roads that would be linked together to form the new automobile highway. In 1918, prison work crews and laborers from St. George and Santa Clara used horse teams and "Fresno scrapers" to improve the route over Utah Hill and through the Beaver Dam Mountains, just north of the boundaries of the NCA. As few segments of the route were engineered roadways, even the most adventurous auto tourists faced mechanical breakdowns, flat tires, and overheated engines when traveling the Arrowhead Trails Highway. Service stations sprang up along remote areas of the route to supply water, gasoline, tire repairs, and overnight cabins and camping areas.

3.13.4 U.S. Highway 91

U.S. Highway 91was the first paved interstate highway constructed through southern Utah during the 1920s and it, too, crossed the NCA. In 1926, a federal system of numbered highways was initiated and the Arrowhead Trails became U.S. Highway 91. This became the primary north-south auto route through Washington County, with various segments being paved as state highway funds were made available. By 1931, the entire length of the highway was paved through the county. Use of U.S. Highway 91 continued until 1971, when I-15 through the Virgin River Gorge was completed. During its heyday as the main north-south transportation route in Washington County, service stations and overnight tourist camps were located at regular intervals along the roadway, including one within the boundaries of the NCA. Today, it is known as Old Highway 91

Photo 3-72 Old Highway 91 (U.S. Highway 91), Beaver Dam Wash NCA

(Photo 3-72) and is the only paved road that crosses the NCA, offering visitor access to its special resource values and scenic vistas.

3.13.5 Site Monitoring

Specific sites in the NCA are regularly monitored by BLM personnel and by trained volunteer site stewards (Photo 3-73) to assess the condition of the site and identify factors (e.g., erosion, grazing, recreation uses, and vandalism) that are negatively impacting that resource. Actions are taken to conserve and protect heritage resources that are being impacted and can include stabilization, the installation of protective fencing or barriers, trail re-alignment, or changes to authorized uses that are having negative effects on the site.

Photo 3-73 Site Stewards in Training

3.14 SPECIAL DESIGNATIONS

3.14.1 Special Designations Not Present in the NCA

3.14.1.1 Wilderness

The National Wilderness Preservation System was established by the Wilderness Act of 1964 to ensure that an increasing population does not occupy and modify all areas of the United States. Congress designates wilderness areas to protect and preserve the lands in their natural state; as such, wilderness areas provide a contrast to lands where human activities dominate the landscape.

There are no Congressionally-designated wilderness areas in the NCA. The Beaver Dam Mountains Wilderness (Utah portion) is located immediately to the south of the NCA but is not included within

"Specific sites in the NCA are regularly monitored by BLM personnel and by trained volunteer site stewards."

"Three segments of Beaver Dam Wash that are partially or entirely within the NCA were evaluated for eligibility and suitability for inclusion into the National Wild and Scenic River System, but were not designated as such."

its boundaries. Congress designated this wilderness area in 1984 through P. L. 98-406. The Joshua Tree Instant Study Area unit was not recommended for wilderness designation by BLM in 1991 and was released from further wilderness consideration by OPLMA.

3.14.1.2 Wild and Scenic Rivers

The Wild and Scenic Rivers Act of 1968, as amended, was passed to protect free flowing rivers or river segments and their related outstandingly remarkable values (e.g. scenic, recreational, geologic, fish and wildlife, historic, or cultural values). Rivers are added to the National Wild and Scenic Rivers System through federal legislation, after a study of the river's eligibility and suitability for designation by one or more of the four federal agencies responsible for managing wild and scenic rivers. Eligibility is an evaluation of whether a candidate river is free-flowing and possesses one or more outstandingly remarkable values. A suitability analysis is designed to determine if the river segment should be protected, and if yes, if designation is the best method of protection. If a river is found to be both eligible and suitable, it can be considered by Congress for inclusion into the National Wild and Scenic Rivers System.

During the early to mid-1990s, the SGFO conducted a comprehensive survey of all rivers and river segments in Washington County. Seventy segments totaling 108 miles were surveyed between 1989 and 1994. That survey was reviewed and updated in 1999 as part of the planning effort for the SGFO RMP. A second update was done in 2001 in conjunction with the *Zion National Park General Management Plan* revision. In preparing the General Management Plan, the NPS evaluated the Virgin River and its tributaries to determine eligibility and suitability for inclusion into the Wild and Scenic River System. As part of that process, several BLM-managed segments of the Virgin River and LaVerkin Creek that flow into and out of Zion National Park were re-evaluated.

There are no Congressionally-designated wild, scenic, or recreational river segments that flow through the NCA. Three segments of Beaver Dam Wash that are partially or entirely within the NCA were evaluated for eligibility and suitability for inclusion into the National Wild and Scenic River System, but were not designated as such (Photo 3-74) (Table 3-25). Congressional designation could occur at some future time.

Photo 3-74 Beaver Dam Wash, Beaver Dam Wash NCA, Considered for Inclusion into the National Wild and Scenic River System, But Not Currently Designated

3.14.2 National Historic Trails (Old Spanish National Historic Trail)

The National Trail System Act of 1968, as amended, established the system of Congressionally-designated National Historic Trails (NHT) to identify and protect historic routes, their historic remnants, and artifacts for public use and enjoyment. National Historic Trails are extended, long distance trails that follow as closely as possible original trails or routes of travel that are of national historical significance.

In 2002, Congress designated several branches of the OST as America's 15th National Historic Trail (P. L. 107-325), through an amendment to the National Trail System Act. This designation acknowledged the significant role that this pack trail network played in the exploration and settlement of the interior Mountain West and southern California. Trail branches cross northern New Mexico, southwestern Colorado, nearly the entire length of Utah, southern Nevada, and southern California. The period of significance for the OST was defined as between 1829 and 1848.

This long distance trail was primarily a pack trail between the Mexican frontier outposts of Santa Fe, New Mexico, and Mission San Gabriel, California, between 1829 and approximately 1848. A travel route between the two Spanish settlements was not pioneered until 1829, when Santa Fe merchant Antonio Armijo led 60 men and 100 mules on journey of exploration. Armijo's group left Abiquiú, New Mexico, in November of 1829 with a mule pack train loaded with woven woolen goods to sell in California. They followed a route that took them through the Four Corners area to the Colorado River, southeastern Utah, and across northeastern Arizona to the Virgin River in Washington County, just west of Hurricane, Utah. The party continued south to a campsite near Littlefield, Arizona, ultimately traveling along the Virgin River to its confluence with the Colorado River east of Las Vegas, Nevada. Traveling southwesterly across the Mojave Desert of Nevada, the Armijo party arrived in Santa Barbara, California three months later. On their return trip to New Mexico, driving horses and mules purchased in California, they followed the route described by the Dominquez-Escalante party in 1776 through southern Utah, arriving in Santa Fe 40 days later. Armijo's party pioneered a new trail and demonstrated the feasibility of commercial trade between New Mexico and California.

In the late 1820s and early 1830s, American explorer Jedidiah Smith and

Table 3-25 Beaver Dam Wash NCA Wild and Scenic River Evaluation History

Segment	Description	Eligible	Date	Suitable	Date	Suitability Evaluation Document
Segment B	Ephemeral and intermittent flow from East Fork of Beaver Dam Wash to just north of Lytle Ranch	No	7/94	No	3/99	SGFO RMP
Segment C	Perennial flow from just north of Lytle Ranch to just south of Lytle Ranch	Yes	8/98	No	3/99	SGFO RMP
Segment D	Ephemeral and intermittent flow from below Lytle Ranch to Utah/Arizona border	No	7/94	No	3/99	SGFO RMP

Antonio Armijo

Armijo was only 25 years old when he left New Mexico for California to sell or trade woolen goods. He returned to New Mexico with horses and mules, but eventually headed back to California to ranch. He married, had seven children, and died at age 46 in 1850. (OST Association n.d.)

fur-trappers like William Wolfskill and George Yount blazed a "northern route" from New Mexico to Green River, Utah, then westward to the Utah Lake area. Their search for beaver trapping areas, in addition to their curiosity about this region that was as yet unexplored by Euro-Americans, took them south along trails traveled by the Ute and other Native Americans through Utah, into southern Nevada, and ultimately to the coastal settlements of California.

The Northern and Southern (Armijo) Routes ultimately came to be known as the "Old Spanish Trail." Each spring, trade caravans left Santa Fe with dozens of pack mules loaded with woolen goods woven in New Mexico and made the 3-month trek to California. Bartering and selling their blankets and serapes in California for horses, mules, and exotic goods such as silk from China, the traders then drove large herds back to New Mexico along this route. Over time, multiple, parallel, and intertwined routes developed, many following trails that had long ago been pioneered by American Indians. During these years, most commercial traders, explorers, horse thieves, and settlers traveled the Northern Route of the OST, negotiating the high ranges of Colorado and New Mexico, the broken terrain of along the Colorado River, and the hot, dry expanses of the Mojave Desert of southwestern Utah, Nevada, and California, before reaching the Spanish missions of southern California.

In 1848, the governor of New Mexico began charging a duty on woven goods traded in California, reducing the profitability of the commercial trade caravans. Use of the OST declined dramatically after this date.

Although few traces of the OST routes have survived, the travel corridors through which the pack mule trains and New Mexico traders passed remain, and the challenges that faced these hardy travelers can still be vicariously experienced.

The legislatively-depicted Northern Route segment of the OST generally follows Old Highway 91 for a distance of approximately 5 miles through the NCA (Map 3-17). The exact route of the trail probably varied somewhat by season and the availability of water and feed. Within this same travel corridor, and following the general alignment of the Northern Route through the NCA, were later roads and highways that developed after the period of significance for the OST, including a mid-19th century wagon road ("the Southern Route—Salt Lake to Los Angeles"), the 1916-era Arrowhead Trails Highway, and U.S. Highway 91, constructed in 1926 (cf. Lyman and Reese 2001).

The legislatively-depicted corridor for the Southern (Armijo) Route of the OST is shown as following the Virgin River east of and outside of the NCA. However, there is some evidence that an alternative to that route, labeled on historic General Land Office (GLO) maps as the "Old Mormon Road/Old Southern Road," was developed through Mine Valley and Bulldog Canyon to avoid the difficulties of travel in the river channel (e.g., flood water, dense vegetation, and quicksand). The alternative route travels through the NCA and converges with the Northern Route near Old Highway 91 (Photo 3-75).

The OST is jointly administered by BLM and NPS along its approximately 2,700 mile length, in partnership with other federal, state, tribal, local government agencies, and private land owners that administer their own lands along the trail. A Comprehensive Administration Strategy has been developed by BLM and NPS for the OST, in partnership with other federal partners, tribal, state, and local government entities, interested parties, and trail-user organizations. This strategy provides guidance for administration of the trail and a vision to be fulfilled through resource-specific studies and site and route segment management plans.

"The Old Spanish Trail's rugged terrain discouraged the use of wagons. It was always a pack route, mainly used by men and mules."
–BLM and NPS, *Old Spanish Trail Official Map and Guide*, 2012

Photo 3-75 OST Potential Southern (Armijo) Route Through Bulldog Canyon

3.14.2.1 Historic Trail Resources, Qualities, and Values

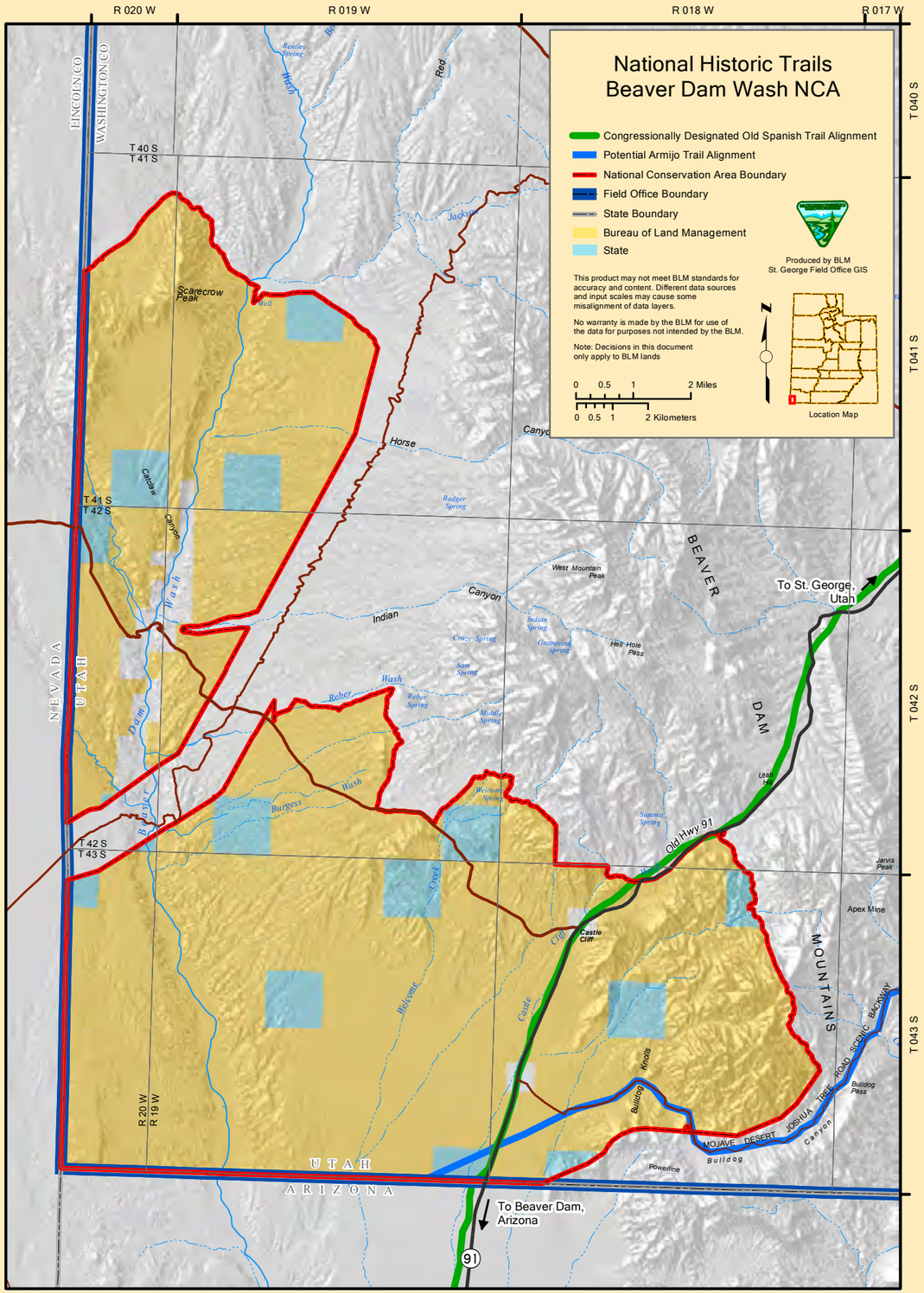
BLM Manual 6280 (2012) provides management guidance related to Congressionally-designated NHTs and these are summarized here. A NHT is managed to recognize the nationally significant resources, qualities, values, and associated settings of the areas through which the trail passes, including the primary use or uses of the trail. These include the significant scenic, historic, cultural, recreational, natural (including biological, geological, and scientific), and other landscape areas through which such trails may pass. High potential historic sites, high potential route segments, and auto tour routes associated with a NHT, collectively labeled Federal Protection Components, are identified by the National Trail administering agency or agencies, through the preparation of a trail-wide Comprehensive Plan. Properties eligible or listed to the National Register of Historic Places, which also may be Federal Protection Components, may be identified along the NHT and may be segments of the trail itself.

Management actions are developed to protect the historic route and its historic traces and artifacts for public use and enjoyment, including the scenic, historic, natural, or cultural qualities of the areas and associated landscape settings, following as closely as possible and practicable the original trails or travel routes of national historic significance. National Historic Trails are also assumed to have associated historic period sites that are eligible for listing on the NRHP. However, Class III archaeological inventories by BLM resource professionals and others (cf., Gourley 2005) along portions of the Northern and potential Southern Routes through the NCA have only recorded traces of a later wagon road, the Old Mormon Road/Old Southern Road, and Old Highway 91; these later uses of the same travel corridors may have modified or destroyed much of the physical evidence of the OST through the NCA.

3.14.2.2 Associated Setting

The associated setting of the OST is determined through an inventory of the geographic extent of the cultural resources, qualities, and values, as well as the visual and natural landscape elements within the surrounding environment that influence the visitor's experience of the trail and contribute to resource protection. This

"There is some evidence that an alternative to the legislatively-depicted corridor for the Southern Route of the OST, labeled on historic General Land Office maps as the "Old Mormon Road/Old Southern Road," was developed through Mine Valley and Bulldog Canyon."



concept is very similar to that of a cultural or vernacular landscape: a geographical area that has historically been used by people, or shaped or modified by human activity, occupation, or intervention, and that possesses a significant concentration, linkage, or continuity of areas of land use, vegetation, buildings, structures, roads, waterways and natural features.

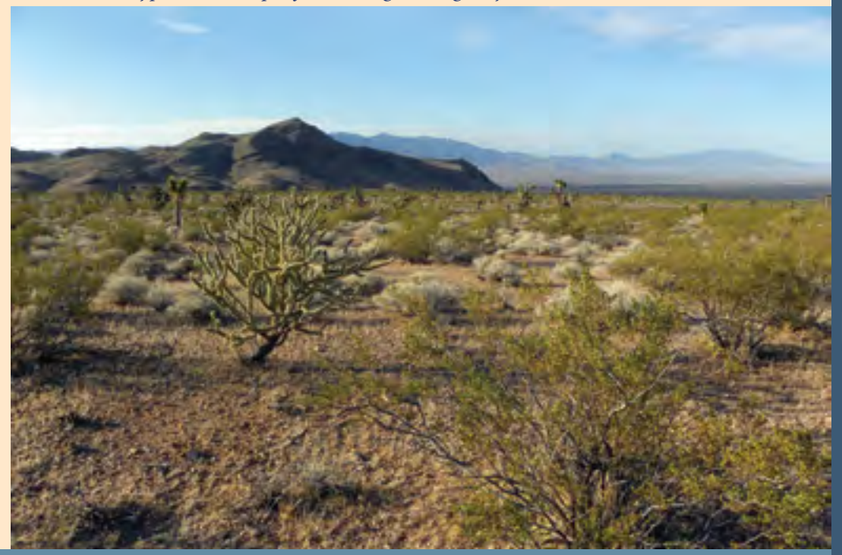
In conducting an assessment of a trail's associated setting, the following variables are evaluated within the context of how each might influence the visitor's experience of the trail:

- Landscape Elements: topography, vegetation, scenic qualities;
- Physical Setting: remoteness, naturalness (contrast between human developments and natural landscape), and visitor facilities;
- Social Setting: contacts (number of contacts with other groups); group size (of other groups); evidence of other visitors, including physical impacts and sights and sounds of others); and
- Operational setting: access (management allocations for types of travel), visitor services (on-site information, agency presence), management controls (types and amount of restrictions placed on recreation visitors).

To date, a complete assessment of all the attributes of the associated setting for the legislatively-designated Northern Route, or for the potential Southern (Armijo) Route, has yet to be completed in the NCA. Along Old Highway 91, the landscape is a broad, gently sloping bajada, dissected by numerous shallow to deep ephemeral drainages that trend southwesterly from the Beaver Dam Mountains to Beaver Dam Wash (Photo 3-76). Bulldog Canyon is a steep-sided canyon bounded by ridgelines and peaks along the western edge of the Grand Wash Fault in the Beaver Dam Mountains. Tabeau Peak rises above the canyon walls near the mouth of Bulldog Canyon. This peak was named by explorer Jedediah Smith in 1827, in honor of a member of his party who was slain by the Southern Paiute as he attempted to recover a stolen mule.

Where wildfires have not altered this landscape, the native vegetation includes Mojave Desert shrubs, grasses, and forbs. Blackbrush, barrel cactus (*Echinocactus* and *Ferocactus* spp.), cholla cactus

Photo 3-76 Typical Landscape of OST along Old Highway 91



"Along Old Highway 91, the landscape is a broad, gently sloping bajada, dissected by numerous shallow to deep ephemeral drainages that trend southwesterly from the Beaver Dam Mountains to Beaver Dam Wash."

"Authorized uses of the public lands adjacent to the legislatively-designated Northern Route of the OST include utility and transportation ROWs, livestock grazing, and motorized and non-motorized recreation."

Photo 3-77 Typical Unburned Landscape of OST Potential Southern (Armijo) Route Through Bulldog Canyon

Photo 3-78 Recreation Vehicle Staging adjacent to Northern Route of the OST and the Potential Southern (Armijo) Route in Bulldog Canyon

Photo 3-79 View from OST of the Beaver Dam Mountains within the OST Viewshed

(*Cylindropuntia* spp.), banana yucca, and the iconic Joshua tree all occur at the higher elevations (Photo 3-77). The creosote bush/white bursage community covers lower elevations of the bajada above the channel of Beaver Dam Wash. Invasive annual brome grasses are prevalent, particularly in fire-damaged areas of the NCA.

3.14.2.3 Primary Uses

Authorized uses of the public lands adjacent to the legislatively-designated Northern Route of the OST include utility and transportation ROWs, livestock grazing, and motorized (Photo 3-78) and non-motorized recreation. These uses are described in detail in other sections of the Affected Environment for the NCA, although data specific to the designated OST routes may not be available. At this time there are no information kiosks and no developed facilities, such as parking areas, in the NCA, and no infrastructure related to the OST.

3.14.2.4 Viewshed Analysis

A Trail Viewshed Analysis was completed by BLM in 2012 to assist with the development of management alternatives for this planning effort that would protect the associated setting of the legislatively-designated Northern Route and the potential Southern (Armijo Route). The results of this analysis are shown on Map 3-18.

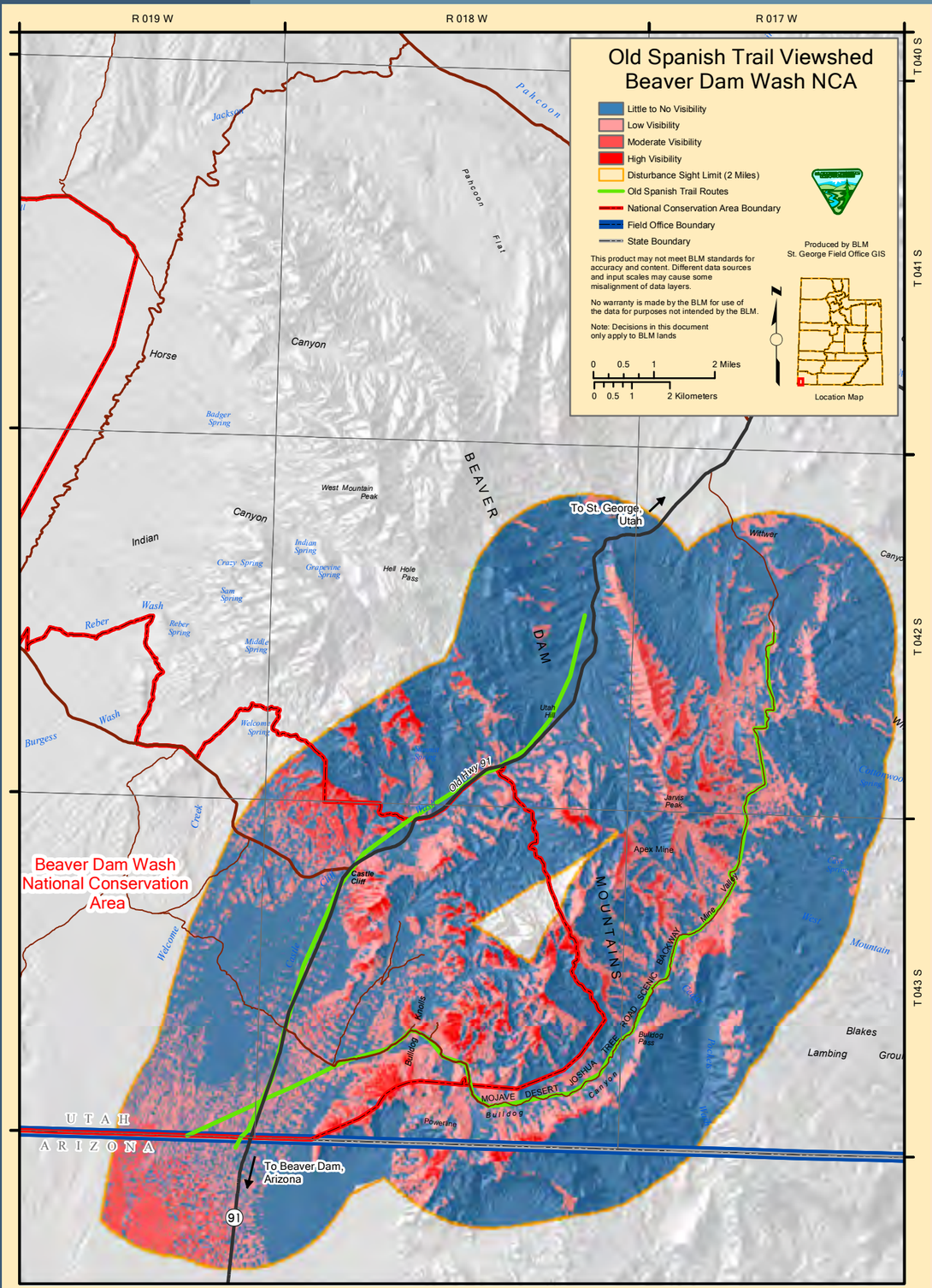
The viewshed from the OST encompasses a vast region. Spanning from the crests of the Beaver Dam Mountains, it sweeps across the flatlands of the Beaver Dam slope, crosses the Beaver Dam Wash and spills over state borders, engulfing the distant peaks of the Mormon Mountains of Lincoln County, Nevada and dipping into the Arizona Strip to the south. The OST viewshed inventory conducted by SGFO only concerns lands within the boundary of the NCA.

To the casual observer, a majority of the area seen from both the Northern and potential Southern routes of the OST appears to be primarily affected by the forces of nature (Photo 3-79). Human developments within the NCA include Old Highway 91, a paved roadway, numerous unpaved roads, and developed range improvements such as water catchments, stock tanks and stock ponds. Collectively, these developments have a relatively small zone of influence on the naturalistic character of the landscape as seen from the OST.

Impacts on scenic or visual resources refer to the change in aesthetic values resulting from modifications to the landscape. Impacts were assessed in terms of visual elements (the attributes of the visible landscape including form, line, color, and texture), visual patterns (the presence, absence, and arrangement of individual elements within a landscape), and visual character (the overall impression created by elements and patterns)—with respect to the anticipated magnitude of change to the landscape. A "visually sensitive area" surrounding the OST was determined by considering the estimated visual impacts of hypothetical future projects and disturbances associated with the construction of recreational trails or amenities and rangeland improvements similar to those already existing in the NCA.

The Trail Viewshed Analysis was conducted using ArcView Spatial Analyst to determine the land surface visible from the OST Northern and potential Southern routes. This process used a linear Key Observation Point (KOP) derived from Old Highway 91 and the Mojave Desert Joshua Tree Road Scenic Backway, which respectively approximate the Northern and Southern routes of the OST within the NCA. This analysis determined all areas visible within the foreground, middle ground, and background distance zones from these routes; it also identified which parts of the landscape would be visible if no vegetation were present to screen the view, reflecting a worst-case scenario in determining areas

"To the casual observer, a majority of the area seen from both the Northern and potential Southern routes of the OST appears to be primarily affected by the forces of nature."



exposed to potential scenic impacts. In reality, existing vegetation would help to minimize impacts on the scenic resources by screening views to and from any future landscape alterations. These viewshed models, along with Google Earth imagery and first-hand knowledge of the area, were used to identify KOPs along each OST route, from which the visibility of the surrounding landscape was verified in the field.

For an observer positioned along either OST route, the farthest extent of visibility with the naked-eye was approximately two miles away, based on the easy discernibility of remote distinguishable features on a day with average atmospheric visibility. To reflect this, the original spatial dataset of the visually sensitive area around the OST was clipped at a two-mile buffer from the centerline of the trail route, creating the final Trail Viewshed Analysis shown in Map 3-18. This analysis revealed four different levels of visibility based on the frequency of times each area can be "seen" from numerous points along the trail. These categories, symbolized by visibility zones, include: "Not Visible," "Low Visibility," "Medium Visibility," and "High Visibility." Areas of "Medium Visibility" and "High Visibility" within the buffer are highlighted in darker shades of red and represent a relatively small portion of the entire viewshed area; these areas correspond with high relief terrain (slopes and mountainsides that face the OST), while blue and light red areas on the map represent lower terrain and other topographically hidden areas. The Trail Viewshed Analysis concluded that any future projects, disturbances, or developments that occur within the boundaries of the OST viewshed (within the two mile buffer) could be discernible by viewers along the trail corridor and could impact scenic or visual resources.

3.14.3 Joshua Tree National Natural Landmark

The National Park Service administers the National Natural Landmark Program which recognizes and encourages the conservation of sites that contain outstanding biological and geological resources. It is the only natural areas program of national scope that recognizes the best examples of biological and geological features in both public and private ownership; NNLs are owned by a variety of land stewards, and participation in the program is voluntary.

Sites are selected for their outstanding condition, illustrative value, rarity,

Photo 3-80 The Joshua Tree National Natural Landmark Dedication Plaque Installed on a Limestone Wall in Bulldog Knolls

National Natural Landmarks Program

The NNL program was established to encourage and support the voluntary conservation of sites that illustrate the nation's geological and biological history, and to strengthen the public's appreciation of America's natural heritage.

"Catastrophic wildfires in 2005-2006 damaged or destroyed many of the Joshua trees of the Joshua Tree National Natural Landmark."

Photo 3-81 Joshua Tree NNL sans Joshua Trees from Wildfire Damage in 2005 and 2006

diversity, and value to science and education and are administratively designated by the Secretary of the Interior with landowner concurrence. To date, nearly 600 landmarks across the United States have received the NNL designation.

NPS administers the program, reports on the condition of the NNLs, and raises public awareness of our nation's natural heritage. Ongoing partnerships with public and private landmark owners allow participants to share information, solve problems cooperatively, and conserve outstanding sites that illustrate the rich and diverse tapestry of the country's natural landscapes.

The approximately 1,047 acre Joshua Tree NNL is located entirely within the NCA (Map 3-19). NPS registered this area to the National Landmark System in 1966 because the Joshua tree forest was considered to be the best example of this natural community at the northern extreme of its range in the Mojave Desert. Sadly, catastrophic wildfires in 2005-2006 damaged or destroyed many of the Joshua trees of the NNL (Photo 3-81).

In 1970, BLM administratively designated this same area as a Natural Area to protect the unique values of these public lands. This administrative designation was not carried forward in the SGFO RMP, but the acreage of the NNL/Natural Area was included in the Beaver Dam Wash ACEC in the 1999 RMP. The area was also studied under Section 603 of FLPMA for its suitability for wilderness designation, but was not recommended by BLM for wilderness designation.

3.14.4 Areas of Critical Environmental Concern

In 1999, the SGFO RMP was approved, establishing management goals, objectives, and direction for public lands in Washington County. The RMP contained management decisions to implement recommendations from the *1994 Mojave Desert Tortoise Recovery Plan* and the 1998 Biological Opinion relating to desert tortoises that was issued on August 12, 1998 (ES/6-UT-98-F-005) by USFWS, as a result of consultations under section 7 of the ESA for the RMP.

One of the key management decisions from the RMP was the designation of an ACEC on public lands in Utah on the Beaver Dam Slope. The Beaver Dam Slope Area ACEC (Map 3-20) was designed to coincide with similar

Photo 3-82 Beaver Dam Slope ACEC at Lower Welcome Creek

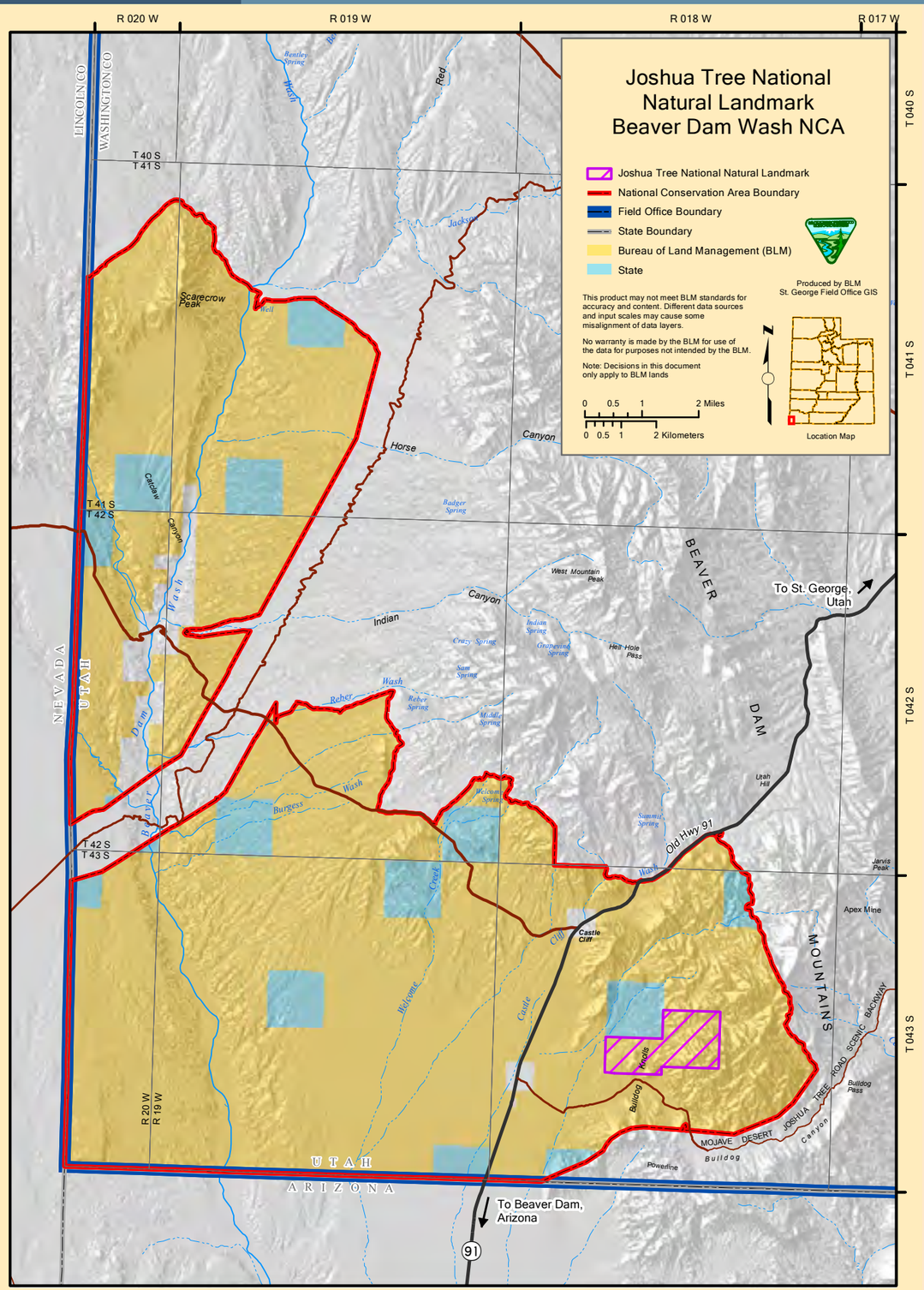
management units on public lands in Nevada and Arizona in the Northeastern Mojave Recovery Unit, identified in the recovery plan. Administrative designation of ACECs across this Recovery Unit would provide a continuous management zone of over 1,750 square miles (approximately 1,120,000 acres) to assist efforts to recover and delist the threatened Mojave desert tortoise through habitat and population protection.

The approximately 48,590 acre Beaver Dam Slope Area ACEC encompasses a majority of the designated critical desert tortoise habitat in Utah within this Recovery Unit (Photo 3-82). Management direction for the ACEC in the RMP included most, but not all, of the recommendations from the recovery plan. As examples, in the ACEC, motorized vehicle travel was limited to designated roads; motorized competitive recreation events were not to be authorized, mineral material sales and other land uses that had the potential to damage critical habitat or impact tortoise populations were not authorized. However, the public lands of the ACEC were not closed to livestock grazing, as was recommended in the recovery plan. Rather, the grazing season of use for the allotments that overlapped the ACEC was limited to the fall and winter months (November to mid-March) when tortoises were generally hibernating in winter dens or burrows. Livestock were to be removed from the ACEC in spring, so that tortoise would not be competing with cattle for forage during critical tortoise growth and reproductive periods.

3.15 VISUAL RESOURCE MANAGEMENT

Joshua trees and dense stands of creosote bush blanket the rolling hills that comprise the lower slopes of the Beaver Dam Mountains, adding to the impression of an inhospitable landscape. Large washes cut through the landscape, all flowing towards the Beaver Dam Wash, a dominant topographic feature of the landscape. Wide panoramic views can be seen from most hilltops. The landscape in the southern and western portions of the NCA displays a gradual transition to Mojave Desert vegetation, including white bursage, creosote, and several species of cholla, yucca, and barrel cactus. For a brief period every spring, the desert comes alive with

"Many people think the desert is ugly because they come here in winter, but even in winter the landscape is beautiful. It just takes a while to see and appreciate the beauty."
–Mary Sisson-Eibs, Arizona Gardener


Joshua Tree National Natural Landmark
Beaver Dam Wash NCA
Joshua Tree National Natural Landmark
National Conservation Area Boundary
Field Office Boundary
State Boundary
Bureau of Land Management (BLM)
State
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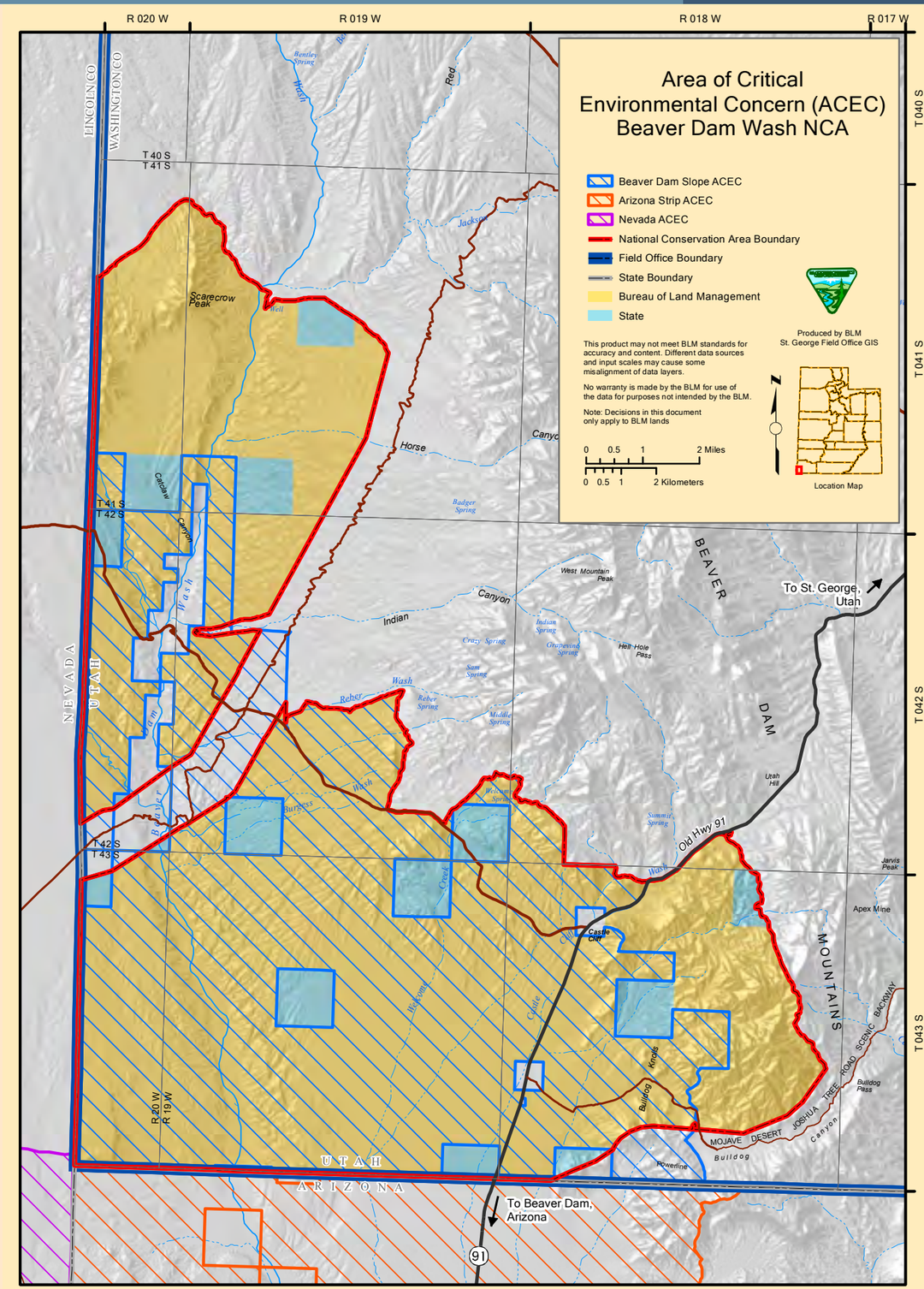
LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
Bentley Spring
Red Wash
Jackson Wash
Scarecrow Peak
Catclaw Canyon Wash
Horse Canyon
Badger Spring
West Mountain Peak
Indian Canyon
Indian Spring
Crazy Spring
Grapevine Spring
Sam Spring
Hell Hole Pass
BEAVER DAM
To St. George, Utah
Reber Wash
Reber Spring
Middle Spring
Burgess Wash
Welcome Spring
Summit Spring
Utah Hill
Old Hwy 91
Jarvis Peak
Apex Mine
Castle Cliff
Welcome Creek
Castle Cliff Wash
Knolls
Bulldog Pass
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
Bulldog Canyon
Powerline
MOUNTAINS
To Beaver Dam, Arizona
91


Area of Critical Environmental Concern (ACEC)
Beaver Dam Wash NCA
Beaver Dam Slope ACEC
Arizona Strip ACEC
Nevada ACEC
National Conservation Area Boundary
Field Office Boundary
State Boundary
Bureau of Land Management
State
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LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
Bentley Spring
Red Wash
Jackson Wash
Scarecrow Peak
Catclaw Canyon Wash
Horse Canyon
Badger Spring
West Mountain Peak
Indian Canyon
Indian Spring
Crazy Spring
Grapevine Spring
Sam Spring
Hell Hole Pass
BEAVER DAM
To St. George, Utah
Reber Wash
Reber Spring
Middle Spring
Burgess Wash
Welcome Spring
Summit Spring
Utah Hill
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Jarvis Peak
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Castle Cliff
Welcome Creek
Castle Cliff Wash
Knolls
Bulldog Pass
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
Bulldog Canyon
Powerline
MOUNTAINS
To Beaver Dam, Arizona
91

vibrant colors as the desert vegetation enjoys a brief annual bloom.

During the summers of 2005 and 2006, wildfires swept through large swaths of the northern and eastern portions of the NCA, charring approximately 50% of the total acreage. The ability of a desert landscape to recover from catastrophic fire is measured in decades and the scars are still visible, with acres of burned Joshua trees dominating large sectors of the landscape. In the southern and western portions of the NCA, the native vegetation communities remain undamaged. Aside from the fire scars, the pristine quality of the visual resources within the NCA is reflective of its rugged and relatively undeveloped nature.

"Aside from the fire scars, the pristine quality of the visual resources within the Beaver Dam Wash NCA is reflective of its rugged and relatively undeveloped nature."

The visual landscape is derived from the mix of natural and man-made elements—form, line, color, and texture—that affect the quality of the visual environment. BLM's VRM System provides a way to identify and evaluate scenic values in order to determine the appropriate level of management. It also provides a way to analyze potential visual impacts and apply visual design techniques to ensure that all proposed activities are in harmony with their surroundings. There are two basic components to the BLM visual resource management system: Visual Resource inventory (VRI) and VRM. VRI classes are an inventory of the landscape; they have no management authority and are used as a planning tool to assist in the development of VRM classes during a resource management planning effort. VRM classes are land use allocations that have specific objectives for allowable uses.

VRI classes are based on the combination of three separate inventories: scenic quality, visual sensitivity, and distance zones. Based on the spatial overlap of these three characteristics, the landscape is assigned VRI classes, which represent the visual value of the landscape.

Scenic quality is described as the visual appeal of an area. The rating is based on seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications. Scenery is classified as A, B, or C, with A being the highest.

Sensitivity is a measure of public concern for the visual landscape. Factors for evaluating sensitivity are: types of users, amount of use, public interest, adjacent land uses, and special areas/unique landscapes. Based on these factors, landscapes are assigned a sensitivity level of high, medium, or low.

Distance zones measure the visibility of a landscape. The Foreground/Middle ground is defined as 0-5 miles from the observer, Background Zone is 5-15 miles, and the Seldom Seen Zone is beyond the background or generally hidden from the observer by topography.

VRI classes represent the relative value of the scenic resources, with Class I representing the highest values and Class IV the lowest values. These inventory classes are informational in nature and provide the basis for considering visual values in the RMP process. They do not establish management direction. The visual resource inventories for the two NCAs were updated in 2010.

Visual values identified through the VRI are considered with other resource values in the Resource Management Planning (RMP) process. Visual Management Classes are established in RMPs in conformance with other land use allocations made in the plan. VRM Classes are specific land use objectives that provide the standards for planning, designing, and evaluating future management projects. VRM Classes are ranked I, II, III, and IV, with Class I being the most protective and Class IV allowing for major manipulation of the landscape.

Visual resources in the NCA are currently managed according to the VRM classes prescribed through the SGFO RMP. The existing VRM Class for the entire NCA area is III. Management objectives for all VRM classes are described in Table 3-26. These classes were developed as part of the 1999 SGFO RMP. The existing acreage of each VRM Class within the Beaver Dam Wash NCA is shown in Table 3-27. A VRI inventory was completed in 2010 and the results are also shown in Table 3-27 and on Map 3-21 and Map 3-22.

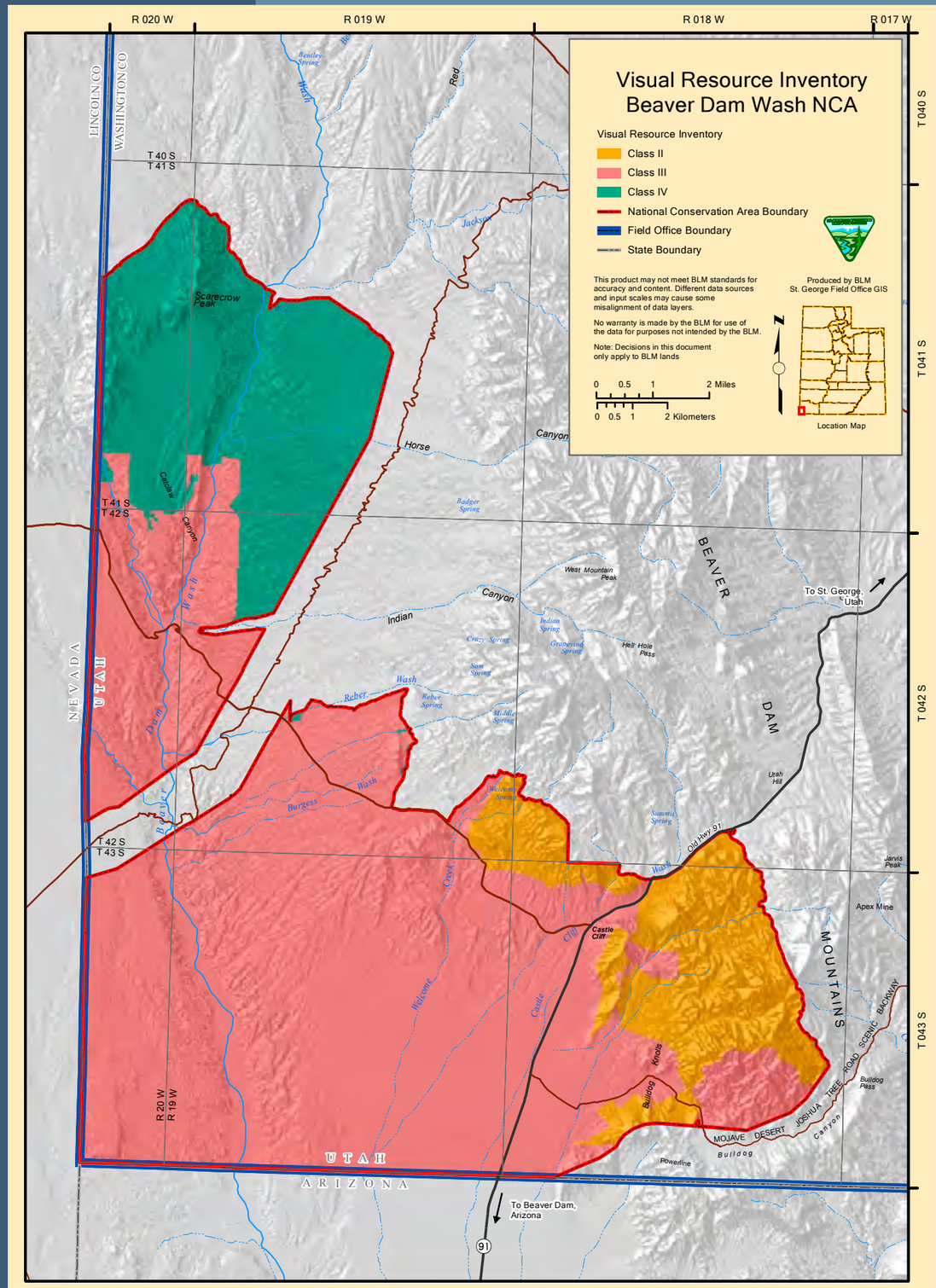
"The desert, when the sun comes up...I couldn't tell where heaven stopped and the Earth began."
–Tom Hanks, Actor, 1956–

Table 3-26 VRM Class Management Objectives

VRM Class	Management Objective
VRM I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention. This class typically applies to lands that have a special designation already in place that protects scenic values.
VRM II	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
VRM III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
VRM IV	The objective of this class is to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Table 3-27 VRI and VRM Class Acreages

VRI Class	Acres	VRM Class	Acres
Class II	7,586	Class II	0
Class III	43,753	Class III	63,480
Class IV	12,138	Class IV	0
Scenic Quality	Acres	Sensitivity	Acres
A	0	High	45,417
B	8,990	Medium	1,111
C	54,488	Low	16,941


Visual Resource Inventory
Beaver Dam Wash NCA
Visual Resource Inventory
Class II
Class III
Class IV
National Conservation Area Boundary
Field Office Boundary
State Boundary
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Location Map
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Indian Spring
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Sam Spring
Reber Wash
Reber Spring
Middle Spring
Dam Wash
Spencer Wash
Burgess Wash
Welcome Creek
Castle Cliff
Summit Spring
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Apex Mine
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Bulldog
Bulldog Pass
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MOJAVE DESERT JOSHUA TREE BACKWAY
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MOUNTAINS
BEAVER DAM
To St. George, Utah
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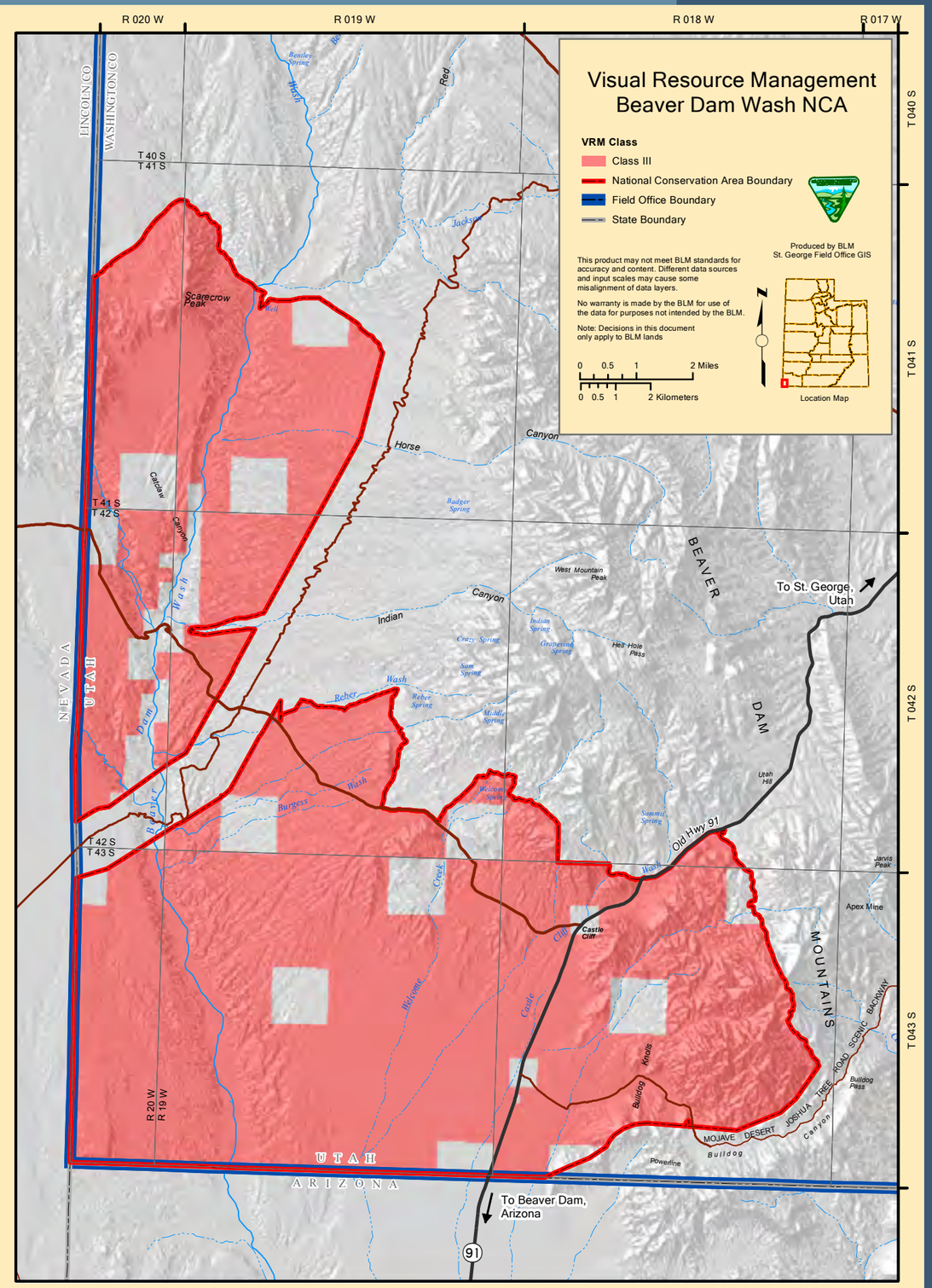
Visual Resource Management
Beaver Dam Wash NCA
VRM Class
Class III
National Conservation Area Boundary
Field Office Boundary
State Boundary
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Reber Spring
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Dam Wash
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Bulldog
Bulldog Pass
Powerline
MOJAVE DESERT JOSHUA TREE BACKWAY
Canyon
MOUNTAINS
BEAVER DAM
To St. George, Utah
To Beaver Dam, Arizona
91

3.15.1 Natural Lightscapes

Starry night skies (Photo 3-83) and natural darkness are important components of National Conservation Lands. Many NCAs are some of the last remaining harbors of darkness and provide an excellent opportunity for the public to experience this endangered resource.

NPS uses the term "natural lightscape" to describe resources and values that exist in the absence of human-caused light at night. Natural lightscapes are critical for nighttime scenery, such as viewing a star-filled sky, but are also critical for nocturnal wildlife habitat. Many species rely on natural patterns of light and dark for navigation, to cue behaviors, or to hide from predators. Lightscapes can be cultural as well, and may be integral to the historical fabric of a place. Human-caused light may be obtrusive in the same manner that noise can disrupt a contemplative or peaceful scene. Light that is undesirable in a natural or cultural landscape is often called "light pollution."

In many areas of the NCA, night skies are only slightly affected by indirect sources of human-produced light from regional metropolitan areas, such as Las Vegas and Mesquite, Nevada, and St. George, Utah. From remote, higher elevations, areas of low relief, or as distance from communities is decreased, the effects of indirect sources of human-produced light are more noticeable. The Beaver Dam Mountains provide an effective screen for the light pollution produced by the greater St. George metropolitan area, giving the NCA spectacular night skies. While some ambient light does filter in from Mesquite, Nevada, just over 20 miles away, the night skies in the NCA can be stunning, particularly in mid-winter when dust and haze are minimal.

Photo 3-83 Night Skies

3.16 NATURAL SOUNDSCAPES

Soundscape is defined as the human perception of acoustic resources, and can include both natural and human-caused sounds (U.S. National Park Service 2014). Natural soundscape also encompasses the physical capacity of the environment and landscape to transmit sounds, as well as the interrelationships among and between different sounds (U.S. National Park Service 2014). Factors such as climate, vegetation, and topography can affect the natural soundscape. Soundscape is managed by taking actions to ensure the prevention or minimization of noise that adversely affects the natural soundscape or that exceeds acceptable levels. Increasing levels of unnatural noise have the potential to diminish the visitor experience and adversely affect wildlife survival rates and distribution.

Sounds are typically measured by their amplitude (volume) and frequency (pitch). Amplitude is measured in decibels (dB) and works on a logarithmic scale, while frequency is measured in Hertz (Hz). Humans with unimpaired hearing can perceive sounds with frequencies between 20 and 20,000 Hz, and with amplitudes as low as 0 dB (U.S. National Park Service 2014). By

Photo 3-84 Noise Source: Motor Vehicles

"For my part I know nothing with any certainty, but the sight of the stars makes me dream."

–Vincent Van Gogh, Painter, Painter, 1853–1890

monitoring chosen sites consistently over time, acoustic technicians can determine the seasonality and cause of various impacts to the natural soundscape. At this time there is no system in place to monitor the natural soundscape of the NCA. Noises in the NCA are known to come primarily from motor vehicle (Photo 3-84) and air traffic, recreational shooting, and visitor activity.

3.17 LANDS WITH WILDERNESS CHARACTERISTICS

Section 201 of FLPMA requires BLM to maintain, on a continuing basis, an inventory of all public lands, resources, and values. This inventory requirement includes maintaining information about wilderness characteristics. Section 201 also provides that the preparation and maintenance of the inventory shall not, in and of itself, change or prevent change of the management or use of the lands. Manual 6310 Conducting Wilderness Characteristics Inventory on BLM Lands provides guidance on how to conduct and maintain an inventory for wilderness characteristics.

Section 202 of FLPMA requires BLM to rely on resource inventories in the development of land use plans, including inventory information regarding wilderness characteristics. Consistent with FLPMA and other applicable authorities, BLM continues to consider the wilderness characteristics on public lands as part of land use planning and when making subsequent project level decisions. In accordance with NEPA, BLM offices must analyze the potential effects of proposed actions and alternatives for land use plan decisions on lands with wilderness characteristics.

The primary function of an inventory is to determine the presence or absence of wilderness characteristics. Keeping an inventory current includes periodically gathering information and ensuring that all inventory files are up to date. This includes relevant narratives, maps, photographs, and any other relevant information.

Early in the planning process for the Beaver Dam and Red Cliffs NCAs, new information was provided by the Utah Wilderness Coalition (UWC), identifying lands that this organization considers as having wilderness characteristics. The UWC provided GIS polygon data that delineated those areas they consider to have wilderness characteristics.

BLM Manual 6310 states: the minimum standard that new information must meet in order for the BLM to consider the information during a wilderness characteristics inventory process requires a submission of the following information to the BLM:

- A map of sufficient detail to determine specific boundaries of the area in question;
- A detailed narrative that describes the wilderness characteristics of the area and documents how that information substantially differs from the information in the BLM inventory of the area's wilderness characteristics; and
- Photographic documentation.

The UWC submission of GIS data satisfied the criteria for a "map of sufficient detail," but there was no accompanying narrative or photographic documentation submitted and the UWC submission was considered incomplete.

While the UWC submission was inadequate, as part of the comprehensive travel planning process, the BLM is conducting an inventory of all public lands administered by the SGFO for wilderness characteristics, including all areas proposed by the UWC. Because of the narrow scope of the Amendment to the SGFO RMP, proposed alternatives regarding the management of public lands to specifically protect wilderness characteristics will be limited in scope to the Beaver Dam Wash and Red Cliffs NCAs.

"I have often lamented that we cannot close our ears with as much ease as we can our eyes."

–Sir Richard Steele, Writer and Politician, 1672–1729

"At 3,000 feet ASI, sloping alluvial bajadas on the western aspect of the Joshua Tree unit gradually give rise to the steep, rugged terrain of the Beaver Dam Mountains, eventually cresting over 6,700 feet on high peaks."

The NCA was inventoried for the presence or absence of wilderness characteristics in early 2012. The characteristics of wilderness: size, naturalness, outstanding opportunities of solitude, and outstanding opportunities for primitive and unconfined recreation, were evaluated during the inventory. The inventory found that wilderness characteristics were present in three areas totaling 43,873 acres, or 69% of the NCA (Map 3-23).

These acres possessed the characteristics of naturalness, solitude, and outstanding opportunities for primitive, unconfined recreation. They also met the criteria for size as they each encompass over 5,000 acres of contiguous BLM lands. The specific inventory criteria used can be found in *BLM Manual 6310* (.06, C, 4-10).

A summary of the inventory below and detailed results can be found in the *Lands With Wilderness Characteristics in Beaver Dam Wash National Conservation Area and Red Cliffs National Conservation Area Inventory* at www.blm.gov.nxld.

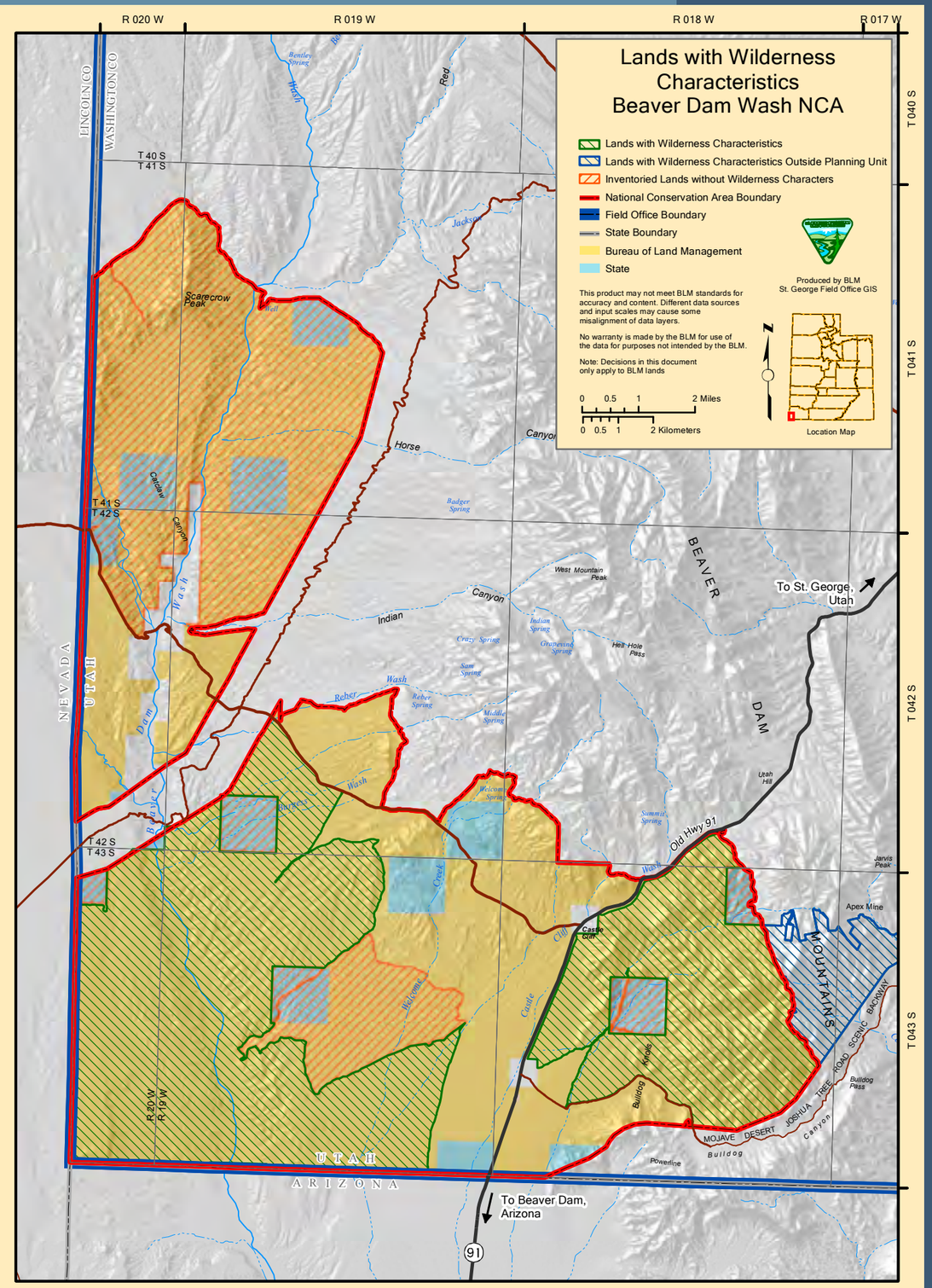
3.17.1 Joshua Tree UT-040-058

Joshua Tree UT-040-058 is a wilderness characteristics inventory unit in the Beaver Dam Mountains. Bounded by Old Highway 91 on the north and the Mojave Desert Joshua Tree Road Scenic Backway on the south, most lands within section UT-040-058 are located within the NCA. Out of 13,482 acres that were inventoried, approximately 11,336 within the NCA were determined to possess wilderness characteristics.

The unit lies on the eastern edge of the Basin and Range physiographic province, adjacent to the Colorado Plateau province. At 3,000 feet ASI, sloping alluvial bajadas on the western aspect of the unit gradually give rise to the steep, rugged terrain of the Beaver Dam Mountains, eventually cresting over 6,700 feet on high peaks (Photo 3-85). Between these two extremes of elevation, the unit encompasses furrowed foothills and numerous rocky drainages. Exposed limestone and sandstone outcroppings characterize the area geologically. These rock layers have been thrust upward at various angles, creating a rugged, variegated topography that contributes to the unique scenic resources of the area.

Because this region straddles the Mojave Desert and the Great Basin Desert, it represents a botanical and zoological commingling of both ecosystems. Creosote, blackbrush and other desert

Photo 3-85 Joshua Tree UT-040-058 Inventory Unit



"Notable wildlife in the region includes desert bighorn sheep, the threatened Mojave Desert tortoise, and a substantial population of raptors."

shrubs blanket the low alluvial plains where a sparse Joshua tree forest grows in the westernmost portion of the unit. Higher elevations are dotted by patches of pinyon-juniper forest with grasses and small shrubs growing in between. It is worth noting that a large portion of the proposed parcel was affected by a wildfire in 2006, which is apparent from the numerous charred, dead Joshua trees in the area and the prevalence of invasive annual brome grasses. Notable wildlife in the region includes desert bighorn sheep, the threatened Mojave Desert tortoise, and a substantial population of raptors.

To the casual observer, the majority of the area appears to be affected primarily by the forces of nature. There are no obvious man-made impacts within the unit that could be considered pervasive and omnipresent. Although power transmission lines flank the unit in designated corridors along its northern and southern boundary roads (Old Highway 91 and the Mojave Desert Joshua Tree Road Scenic Backway, respectively), their metal towers have a relatively small zone of influence on apparent naturalness, as the viewshed from the interior of the unit is buffered by numerous topographic barriers.

Sandy drainages fan into the mountains from the unit's boundaries, allowing people to disperse and avoid the sights and sounds of others easily. The broken terrain, combined with vegetative screening from bushy shrubs and pinyon-juniper trees in the unit, helps to afford outstanding opportunities for solitude. Lesser amounts of topographic and vegetative screening are available throughout the lower elevations of the unit, where the land is relatively flat and the vegetation consists mostly of low shrubs. Even so, solitude may still be experienced here due to the large size of this area.

In addition to a sense of solitude, visitors to this area may also enjoy outstanding opportunities for primitive and unconfined recreation. A popular rock climbing area in the NCA named "Woodbury Road Crags" is accessible via the Mojave Desert Joshua Tree Road Scenic Backway within the unit (Photo 3-86). Besides rock climbing, this area offers outstanding opportunities for hiking, backpacking, climbing, hunting, horseback riding, rock-hounding, sightseeing and photography.

Photo 3-86 Woodbury Crags Climbing Area within Joshua Tree UT-040-058 Inventory Unit

3.17.2 Beaver Dam Wash UT-040-059

Inventory unit Beaver Dam Wash UT-040-059 is located on the far southwestern corner of Washington County, Utah on the western flank of the Beaver Dam Mountains. The unit is bounded by dirt roads on its northwest, northeast and western borders, while the Utah-Arizona state line forms its southern boundary and the Utah-Nevada border forms its western boundary. A designated ROW corridor affects the northwestern boundary of the unit, the only portion of the unit that is not within the NCA. The boundary of the NCA encompasses approximately 19,797 acres of lands with wilderness characteristics within unit UT-040-059.

The terrain here consists of low elevation bajadas and steep drainages that descend from the foothills of the Beaver Dam Mountains (Photo 3-87) in the east and the Utah-Nevada border in the west to meet at the Beaver Dam Wash, a wide, sandy drainage running northwest to southeast through the central-western portion of the unit. Elevations range from approximately 3,500 feet on the bajadas to 2,200 feet in the Beaver Dam Wash, the lowest elevation in Utah. Although perennial flow exists upstream, the portion of the wash within unit UT-040-059 is typically dry throughout most of the year. Vegetative communities are typical of the Mojave Desert ecosystem—Joshua trees, blackbrush, cholla cactus, barrel cactus, creosote, yucca (*Yucca* spp.), Mormon tea and low grasses can all be found here.

This inventory unit lies within the boundaries of two active grazing allotments: Beaver Dam Slope and Scarecrow Peak. Of these, Beaver Dam Slope occupies the largest area within unit UT-040-059. The primary human use of this parcel is grazing, evidenced by frequent areas of bare or trampled ground, livestock trails, dung, and numerous sightings of cattle. Many range improvements (stock tanks, water catchments, etc.) are located throughout unit UT-040-059, mainly along existing boundary roads or cherry-stemmed roads. A higher concentration of these developments and their corresponding access roads exist on the Beaver Dam Slope Allotment, in the eastern portion of the inventory unit. Here, the cumulative impact of range management infrastructure and regular vehicular traffic within interior portions of unit UT-040-059 are substantially noticeable

Photo 3-87 Beaver Dam Wash UT-040-059 Inventory Unit

"Vegetative communities are typical of the Mojave Desert ecosystem—Joshua trees, blackbrush, cholla cactus, barrel cactus, creosote, yucca, Mormon tea and low grasses can all be found here."

"It is worth noting that the majority of the Scarecrow Peak inventory unit was affected by a large wildfire in 2005, as evidenced by the many dead and charred Joshua trees. As a result, this area is very barren in terms of vegetation."

to the average visitor, impacting the apparent naturalness of the landscape. This influence was considered pervasive and omnipresent, enough to warrant the area's exclusion from consideration during the inventory process.

The mile-wide Navajo-McCullough power line corridor along the northwestern boundary of the unit affects the naturalness of unit UT-040-059. Because developed ROWs are pre-existing land-use authorizations that are treated as substantially noticeable human impacts, these acres were excluded from consideration during the wilderness characteristics inventory.

With the exception of these exclusions, the remainder of unit UT-040-059 appears to be primarily affected by the forces of nature to the common observer, with signs of human impacts being substantially unnoticeable.

Outstanding opportunities for solitude are available throughout the unit because it covers a vast area where people can disperse to avoid the sights and sounds of others easily. Much of the topography is flat across the alluvial plain, but vegetative screening is provided by numerous, large Joshua trees and smaller creosote bushes. Closer to Beaver Dam Wash, the terrain becomes more dissected, carved by steep ephemeral drainages, that are effective topographic and vegetative screening. However, the absence of reliable water sources and shade, combined with vast tracts of unvarying terrain do not make this area especially attractive to recreational users who prefer primitive and unconfined experiences.

3.17.3 Scarecrow Peak UT-040-051

Inventory unit Scarecrow Peak UT-040-051 is located along the Nevada border, on the western flank of the Beaver Dam Mountains. Much of this inventory unit is located on a low elevation bajada spanning from the foothills of the Beaver Dam Mountains and Scarecrow Peak down to the Beaver Dam Wash. Elevations within the unit range from nearly 4,500 feet at the top of Scarecrow Peak to 2,900 feet in the Beaver Dam Wash.

The Beaver Dam Mountains lie on the eastern edge of the Basin and Range geologic province, adjacent to the Colorado Plateau. The unit encompasses both gently sloping alluvial plains and steeper topography carved by drainages. A Joshua tree forest covers a portion of the northeast landscape across the vast

Photo 3-88 Scarecrow Peak UT-040-051 Inventory Unit

alluvial plains that span the unit. Other species typical of the Mojave Desert—cholla cactus, yucca, creosote and blackbrush—characterize the predominant vegetation types in the area. Cottonwood trees and other forms of riparian vegetation are also present in the Beaver Dam Wash. It is worth noting that the majority of unit UT-040-051 was affected by a large wildfire in 2005, as evidenced by the many dead and charred Joshua trees. As a result, this area is very barren in terms of vegetation.

The unit is bounded by dirt roads on its northern, southern and eastern borders. The Navajo-McCullough interstate power transmission line lies within a designated corridor that affects the eastern boundary of the unit. Beaver Dam Wash also runs northeast to southwest through the central portion of the unit. Lytle Ranch, a desert research facility operated by Brigham Young University, is located along the unit's southern border in Beaver Dam Wash on private property jointly managed by The Nature Conservancy, Brigham Young University, and Dixie State University.

The area lies within the boundaries of the Scarecrow Peak grazing allotment. The primary human use of this parcel is grazing, which is evidenced by frequent areas of trampled ground, livestock trails, dung, and sightings of cattle. In addition, range improvements and their corresponding access routes exist throughout the area.

Opportunities for solitude exist, but only in isolated places throughout unit UT-040-051. Large areas exist with little to no topographic and vegetative screening, especially in the burned area. A spatial analysis determined that all areas containing outstanding opportunities for solitude (those places where a visitor could easily find seclusion with either sufficient topographic or vegetative screening) comprised less than 5,000 acres collectively; however, this area was not disqualified from consideration based on the finding that outstanding opportunities for solitude exist in only a portion of the area. To an extent, the overall size of unit UT-040-051 allows visitors to avoid sights/sounds of other visitors, but not to a degree sufficient as to be considered "outstanding."

Overall, unit UT-040-051 was not determined to possess outstanding opportunities for solitude because the impacts from outside the inventory area are pervasive and omnipresent, largely interfering with one's ability to avoid sights, sounds and evidence of other people in the area.

There are no outstanding opportunities for primitive and unconfined recreation within inventory unit UT-040-051 because there are no especially enticing features or attractions within the area that lend themselves to such activities. The absence of vegetation provides no shade or protection from the elements, making the area unattractive to most primitive recreational user groups such as hikers, backpackers, bird watchers, and horseback riders. Even climbing and bouldering—activities that are otherwise popular in the vicinity of the Beaver Dam Mountains—are not and could not be popular in this area for lack of suitable boulders and rock faces. It is doubtful that people would be willing to travel to this area for primitive and unconfined recreational opportunities.

Due to its lack of outstanding opportunities for solitude and primitive and unconfined recreation, it was determined that inventory unit UT-040-051 does not possess wilderness characteristics.

"There are no outstanding opportunities for primitive and unconfined recreation within the Scarecrow Peak inventory unit because there are no especially enticing features or attractions within the area that lend themselves to such activities."

3.18 RECREATION AND VISITOR SERVICES

Everything that visitors see, do, sense, and feel in the NCA constitutes their visitor experience. Those experiences are defined by the color, contrast, and beauty of the visual landscape, the depth and diversity of recreation opportunities, the quality and variety of interpretive materials, and the design and characteristics of visitor facilities.

3.18.1 Recreation

The climate of the NCA allows for enjoyable outdoor recreation opportunities in all but the hottest months of summer. The NCA location, within easy driving distance of Las Vegas and Mesquite, Nevada, and St. George, Utah, via I-15 and Old Highway 91, make it a potential recreation destination for many more visitors in the future.

The major attractions consist of world class rock climbing, a network of dirt roads popular with ATV enthusiasts, and robust upland game bird hunting opportunities. There were 8,890 visits to the NCA in 2013, and this number is anticipated to grow as information about the NCA is more widely disseminated and visitor services facilities are developed.

Climbers first visited the popular Woodbury Road Crags (Photo 3-89) in the early 1990s, attracted by the desert climate and high quality limestone. The climbs here consist of three popular crags, Black and Tan, Kelly's Rock, and The Solstice. Over 70 climbs, ranging in difficulty from 5.7 to 5.14, are easily accessible via short hikes from the graded and maintained Mojave Desert Joshua Tree Scenic Backway. All of the climbs are bolted sport climbs. Standard bolt hangars are used in the area. These are gray in color, generally matching the mixed gray hues of the limestone. It takes a keen eye and a walk to the base of a climb before the bolts become visible.

Climbers accounted for 2,953 visits in 2014. This number is expected to increase as the area becomes a popular destination for climbers from Las Vegas, Nevada, Salt Lake City, Utah, and Southern California. Other climbs with similar qualities to the Woodbury Road Crags exist just outside the NCA boundary.

Upland game bird hunting accounted for 2,570 visits in 2014, with Gambel's quail (Photo 3-90) being the target species. This number is not expected to change dramatically as it is based on the availability of hunting permits and the popularity of the sport. Hunting season opens in the fall, when cooler temperatures entice many hunters to camp in the area (dispersed campsites are shown on Map 3-24). Hunting for desert bighorn sheep also occurs in the Beaver Dam Mountains, but the number of visitors engaged in this activity is limited by the number of bighorn permits issued by UDWR.

The remaining 2,640 visits were comprised of ATV riders (Photo 3-91), backcountry driving enthusiasts, outdoor photographers, and some equestrian trail riders. The gently rolling terrain and hard-packed roads make for pleasant driving conditions. The most popular times to visit are during the spring, when the desert is in full bloom, and in the fall, when the temperatures drop to tolerable levels. The visitation numbers are expected to increase, particularly during the spring, as the NCA becomes a popular destination for desert wildflower viewing.

Commercial use is considered sparse in the NCA when compared to other public lands managed by SGFO. There are 14 hunting outfitters who are permitted to operate in the NCA, within the larger Pine Valley Herd Unit for mule deer; however, the majority of the authorized hunts occur outside the NCA. There are 12 rock climbing outfitters authorized to operate in the NCA and all guided climbs take place at the Woodbury Road Crags. All visits from guided trips have been included in the visitation totals listed above.

Gambel's Quail

Callipepla gambelii can be found in coveys consisting of a dozen or more birds. They walk or run on the ground, taking flight explosively when startled or escaping threats. Quail search for food by scratching under shrubs and cacti as well as eating grasses and cactus fruits.

3.18.2 Facilities

At this time, there are no developed facilities within the NCA.

3.18.3 Interpretation/Visitor Understanding

BLM's website and the Public Lands Information Center in St. George are the only locations where the public can currently obtain information about the NCA. In 2010, the SGFO produced a special edition 1:100,000 scale topographic and land status visitor use map of Washington County which showed all Congressionally-designated areas (NCAs, wilderness areas, and wild and scenic rivers), as well as other popular recreation trails, special management areas, and interpretive sites; visitor information about the NCA and its values was also included on the reverse side of the map.

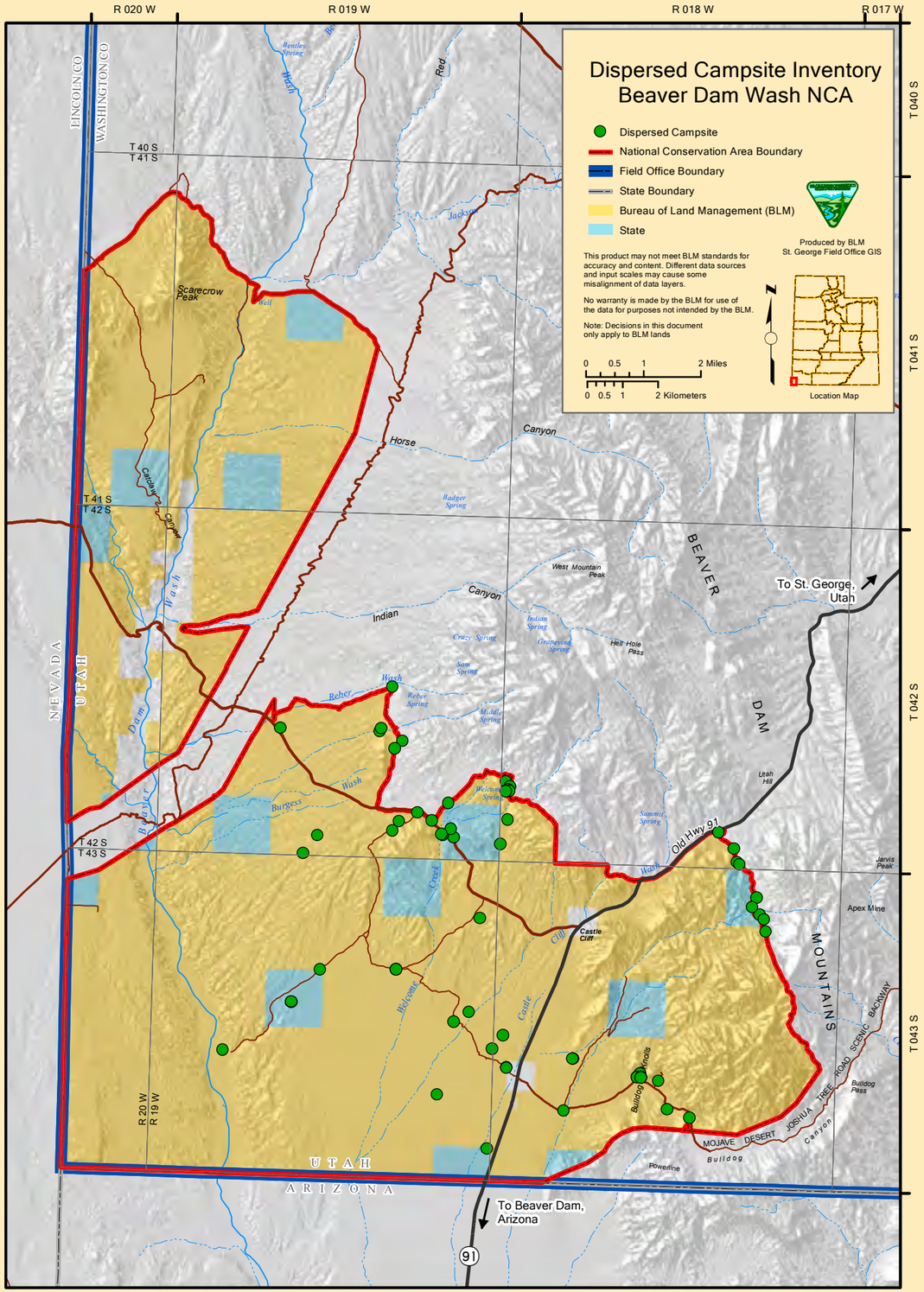
The SGFO also prepared a fact sheet in 2010 that provides information about the resource values of the newly-designated NCA, with a map showing the location and boundaries of the new unit. A second fact sheet focuses on hunting in the NCA, as it relates to the required use of designated roads for motorized vehicle travel. Both fact sheets are available in the Public Room of the SGFO Public Lands Information Center and are also posted on the SGFO website.

Photo 3-89 Kelly's Rock at Woodbury Road Crags, Beaver Dam Wash NCA

Photo 3-90 Gambel's Quail, Upland Game Bird

Photo 3-91 Staging Area for OHV Recreation in Beaver Dam Wash NCA

"What an odd sport we inhabit, where bits of obscure rock in remote locations are recognizable."
–Richard Pawlowicz, Climber



3.19 COMPREHENSIVE TRAVEL AND TRANSPORTATION MANAGEMENT

Comprehensive Travel and Transportation Management (TTM) is the process of planning for and managing transportation systems on public lands. Traditionally, BLM's Travel and Transportation Program focused primarily on motor vehicle use. Within the framework of TTM, the program has been significantly expanded to encompass all forms of transportation, including travel by foot, horseback, bicycle, motorcycle, aircraft, and four-wheeled vehicles (ATVs, cars, and trucks).

Additionally, TTM expands on the traditional approach to transportation planning by implementing an interdisciplinary structure, in that all resources, resource uses, and accompanying modes of travel on public lands are addressed holistically. The goals, objectives, and desired future conditions of all resources and resource uses are recognized and addressed with TTM.

3.19.1 OHV Designations

In compliance with current laws, policies, and executive orders, BLM OHV regulations form a framework for the establishment of management areas as either "open", "limited", or "closed" to off-road vehicle use.

- "Open" areas are areas where all types of vehicle use is permitted at all times, anywhere in the area. Cross-country travel is allowed in open areas.
- "Limited" areas are areas that may be restricted at certain times, in certain areas, and/or to certain types of vehicles. The most common restriction is "Limited to Designated Roads and Trails," but in areas where individual route designation has yet to occur, this can include "Limited to Existing Roads and Trails."
- "Closed" areas are closed to all types of vehicle use and typically include areas like designated wilderness, which are closed to all motorized and mechanized use.

Area designations relating to OHV travel are typically made during the development of an RMP. In the case of the NCA, however, upon designation Congress identified three large polygons where all motorized vehicle travel was to be limited to designated roads and trails (except for administrative purposes and emergency response), and also designated the specific roads within those polygons that would remain available for public travel (Map 3-25 and Map 3-26). Outside of these three areas, all motorized vehicle travel was to be limited to designated roads and trails that would be determined at a future date through a comprehensive travel and transportation management planning process to be completed by BLM for Washington County. Table 3-28 reflects the OHV area designations that resulted from mandates from OPLMA Section 1975 (e).

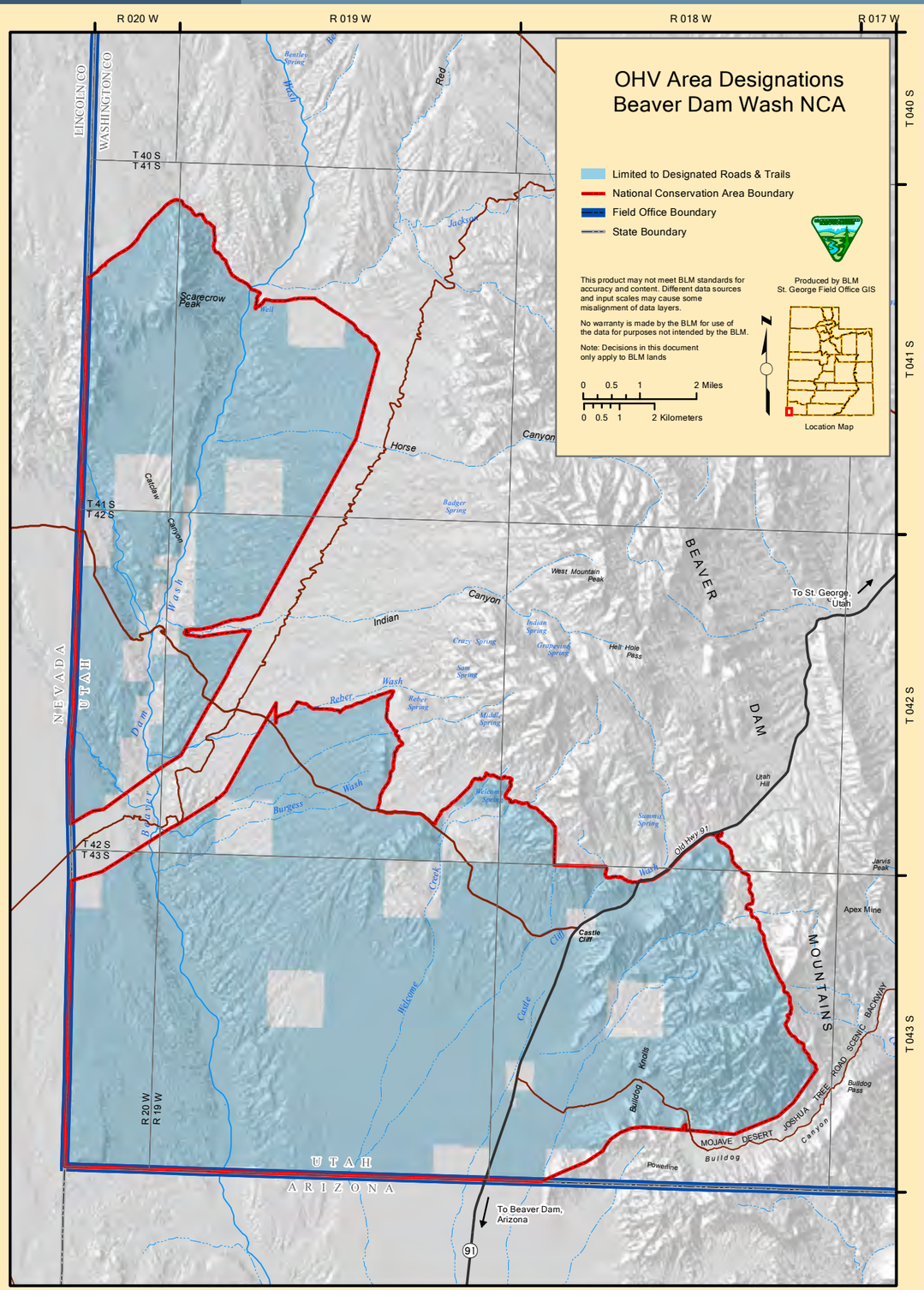
3.19.2 Travel Management

The southern and western boundaries of the NCA are formed by the state borders of Nevada and Arizona. Old Highway 91 is the only paved highway through the NCA, bisecting the eastern half and providing a link between I-15 to the south and the greater St. George urban area to the north. The NCA is also bisected by a one-mile wide designated utility corridor ("IPP corridor") and bounded on the southeast by a similar one-mile wide designated utility corridor

Table 3-28 Existing OHV Area Designations

OHV Area Designation	Acreage
Open	0
Limited to Existing Roads and Trails	0
Limited to Designated Roads and Trails	63,480
Closed	0

"Comprehensive Travel and Transportation Management is the process of planning for and managing transportation systems on public lands."


OHV Area Designations
Beaver Dam Wash NCA
Limited to Designated Roads & Trails
National Conservation Area Boundary
Field Office Boundary
State Boundary
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St. George Field Office GIS
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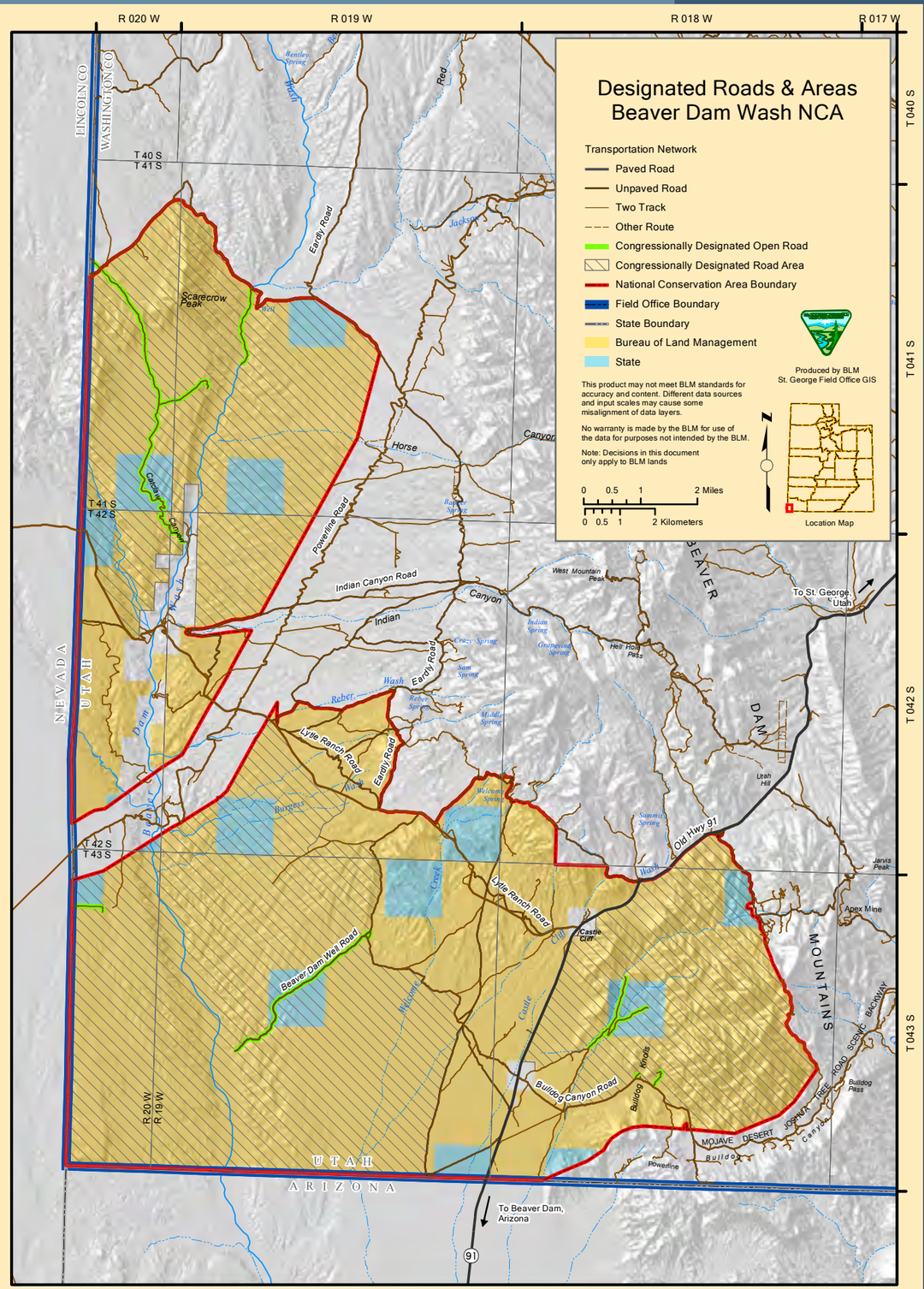
T 43 S
R 20 W
R 19 W
LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
Scarecrow Peak
Well
Red Wash
Bentley Spring
Jackson
Horse Canyon
Catclaw Canyon Wash
Badger Spring
West Mountain Peak
Indian Canyon
Indian Spring
Grapevine Spring
Crazy Spring
Sam Spring
Hell Hole Pass
BEAVER DAM
Reber Wash
Reber Spring
Middle Spring
Burgess Wash
Welcome Spring
Summit Spring
Old Hwy 91
Utah Hill
Jarvis Peak
Apex Mine
Castle Cliff
Welcome Creek
Castle Cliff Wash
Knolls
Bulldog Pass
Powerline
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
MOUNTAINS
To St. George, Utah
To Beaver Dam, Arizona
91


Designated Roads & Areas
Beaver Dam Wash NCA
Transportation Network
Paved Road
Unpaved Road
Two Track
Other Route
Congressionally Designated Open Road
Congressionally Designated Road Area
National Conservation Area Boundary
Field Office Boundary
State Boundary
Bureau of Land Management
State
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LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
Scarecrow Peak
Well
Red Wash
Bentley Spring
Jackson
Eardly Road
Horse Canyon
Catclaw Canyon Wash
Powerline Road
Badger Spring
West Mountain Peak
Indian Canyon Road
Indian Canyon
Indian Spring
Grapevine Spring
Crazy Spring
Sam Spring
Hell Hole Pass
BEAVER DAM
Reber Wash
Reber Spring
Middle Spring
Lyttle Ranch Road
Eardly Road
Burgess Wash
Welcome Spring
Summit Spring
Old Hwy 91
Utah Hill
Jarvis Peak
Apex Mine
Beaver Dam Well Road
Castle Cliff
Welcome Creek
Castle Cliff Wash
Bulldog Canyon Road
Knolls
Bulldog Pass
Powerline
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
MOUNTAINS
To St. George, Utah
To Beaver Dam, Arizona
91

("Navajo-McCullough corridor") (Photo 3-92 and Photo 3-93). As described above, three large polygons were identified by Congress at the time of NCA designation as "Designated Road Areas" and specific routes within them designated for public motorized vehicle travel. All other routes within the Designated Road Areas were closed to the public by Congress. A total of 29 miles were closed.

The outer boundary of the NCA is 73 miles in circumference and is punctuated by 15 roads and 30 ephemeral drainages. Section 1977 of OPLMA requires that a Travel Management Plan (TMP) be completed for the NCA. This is important for the NCA because Congress has emphasized the conservation of the public lands and their resource values. By developing a TMP that strives to achieve the desired future conditions of all resources, the NCA can be managed to conserve, protect, and enhance the resource values for which it was Congressionally-designated. Issues being addressed in the TMP include designating every road and trail, both motorized and non-motorized, outside of the Congressionally-designated road areas within the NCA. Individual route designations will be developed in the field office-wide TMP, supported by an EA. During the TMP process, BLM will consider the legal and regulatory requirements of an array of federal laws, such as the National Historic Preservation Act and the Endangered Species Act, as well as the minimization criteria found at 43 CFR 8342.1. The two planning efforts (RMP and TMP) are on parallel but separate tracks, with the TMP/EA following the RMP/EIS processes.

The TMP is not intended to provide evidence bearing on or addressing the validity of any RS 2477 assertions and does not take RS 2477 assertions or evidence into account during the evaluations of specific roads. The purpose and need for travel management planning is to provide manageable and sustainable access to public lands within the context of resource protection. At such time as a decision is made on RS 2477 assertions, BLM will adjust its travel routes accordingly (*BLM Manual 1626*).

"The TMP is not intended to provide evidence bearing on or addressing the validity of any RS 2477 assertions and does not take RS 2477 assertions or evidence into account during the evaluations of specific roads."

3.20 LANDS AND REALTY

The goals of the lands and realty program are to manage the public lands to support the goals and objectives of other resource programs, provide for uses of public lands in accordance with applicable laws and regulations, and improve management of the public lands through land tenure adjustments.

3.20.1 Land Tenure Adjustments

OPLMA designated approximately 63,500 acres of federally administered land on the Beaver Dam Slope as the NCA. The majority of the non-federal acreage (8,600 acres) within the boundaries of the NCA is administered by the Utah School and Institutional Trust Lands Administration (SITLA) (6,500 acres), with the remainder being private property inholdings. The non-federal inholdings afford opportunities for future land acquisition from willing sellers to consolidate land tenure in the NCA.

Photo 3-92 IPP Corridor, Beaver Dam Wash NCA

3.20.2 Linear ROWs

A linear ROW grant is generally a long-term (30 years) authorization issued for necessary transportation, utilities, or other systems or facilities that are in the public interest and require ROWs to use public lands for specified purposes. These purposes may include roads, pipelines, and utility lines, as well as temporary uses of additional public lands for purposes necessary to the project. Public land law directs BLM to minimize adverse environmental impacts by avoiding the proliferation of separate ROWs and using ROWs in common to the greatest practical extent (FLPMA Section 503, 43 USC 1763). The use of designated corridors and use areas for linear ROWs is encouraged to the greatest extent possible.

Some linear uses across public lands may have "grandfathered" rights of use from federal laws that predate FLPMA, such as public highways under RS 2477, and reservoirs, canals, and ditches under RS 2339 and RS 2340.

The only designated ROW corridor within the NCA follows Old Highway 91 and is defined by existing range fencing along each side of the highway (SGFO RMP 1999: Lands Decision LD-14). The total width of the corridor varies from 150-400 feet. The ROW for Old Highway 91, held by Washington County, is a total of 100 feet wide and is located within the designated ROW corridor. The existing fencing does not accurately mark the limits of the highway ROW held by Washington County.

Other linear ROWs within the NCA were granted for:

- Fiber optic line (UTU-84783) authorized to Rio Virgin Telephone Co. that runs from Bloomington, Utah to Mesquite, Nevada;
- Multiple geophysical testing lines (UTU-71319), granted to USGS Water Resource Division;
- Road ROW (UTU-62307) granted to Washington County for a 1,500 foot realignment of Lytle Ranch Road.

Two one-mile wide designated ROW corridors are located outside the NCA boundaries: the IPP corridor on the west and the Navajo-McCullough

"A linear ROW grant is generally a long-term (30 years) authorization issued for necessary transportation, utilities, or other systems or facilities that are in the public interest and require ROWs to use public lands for specified purposes."

Photo 3-93 Navajo McCullough Corridor, Beaver Dam Wash NCA

"Commercial film permits comprise the majority of the requested land use authorizations."

Photo 3-94 Commercial Film Permit in Action

corridor that follows Bulldog Canyon, bounding the southeast side of the NCA. Both were corridors that were designated through the 1999 SGFO RMP and were carried forward in the *Programmatic EIS (PEIS), Designation of Energy Corridors on Bureau of Land Management-Administered Lands in the 11 Western States* (BLM 2009c), which amended BLM RMPs as needed. A number of power transmission lines, natural gas, and petroleum pipelines have been constructed in the IPP corridor, while a power transmission and a fiber optic line are located within the Navajo-McCullough corridor.

ROW corridors in and adjacent to the NCA are shown in Map 3-27; Avoidance areas are shown in Map 3-28.

3.20.2.1 Site Type ROWs

Site type ROWs are granted for specific uses of public lands that are areal rather than linear in nature. The eastern boundary of the NCA abuts the established Scrub Peak Communication Site and its access road. The access road to the communication site comprises a portion of the eastern boundary of the NCA. The Scrub Peak site provides communication and microwave services to the communities of Washington County, Utah, Beaver Dam, Arizona, and Mesquite, Nevada, as well as to motorists traveling along I-15. The site currently has three authorized developments and that number will likely increase as demand for cellular and internet services grow.

3.20.3 Other Land Use Authorizations

Prior to issuance of any land use authorization, site-specific NEPA analysis, along with applicable environmental inventories and evaluations, must be completed. The applicant is required to pay application fees, monitoring fees, and fair market value rental, as well as to comply with all other applicable regulations pertaining to the type of authorization requested.

3.20.3.1 Permits and Leases

Permits are usually short-term authorizations, not to exceed three years, allowing few or no permanent facilities. Permits have been used for temporary storage sites, apiary (bees) sites, commercial filming/photography, engineering feasibility studies, and other miscellaneous short-term activities with little or no resource disturbance. Leases are long-term authorizations that usually require a significant economic investment in the land.

Commercial film permits (Photo 3-94) comprise the majority of the requested land use authorizations. Over the past 10 years approximately 2 to 3 applications per year for filming permits have been granted for activities (e.g., guided hunts) in the NCA. Film permits are granted subject to minimum impact requirements and activity-specific NEPA analyses.

3.20.3.2 Easements Granted to BLM

There are also three BLM-held easements across private/state land within the NCA. An easement for a water pipeline was acquired from both SITLA and the Bowler Family (private property owners) for a water pipeline known as the Summit Springs Pipeline; another pipeline easement was acquired from the Nature Conservancy for the Terry Bench water pipeline.

3.21 SOCIAL AND ECONOMIC CONDITIONS

This section represents a summary of the most recent data available from 2012 or 2013 to describe the social and economic conditions that are relevant for this planning effort. The data generally reflect conditions and values for all public lands and uses managed by the SGFO in Washington County, although separate summaries are provided for the Beaver Dam Wash and Red Cliffs NCAs where relevant data were available. The Socioeconomic Baseline Report (Pinkham 2012) upon which this summary is based is available online at: www.blm.gov/nxld.

3.21.1 Overview of Washington County

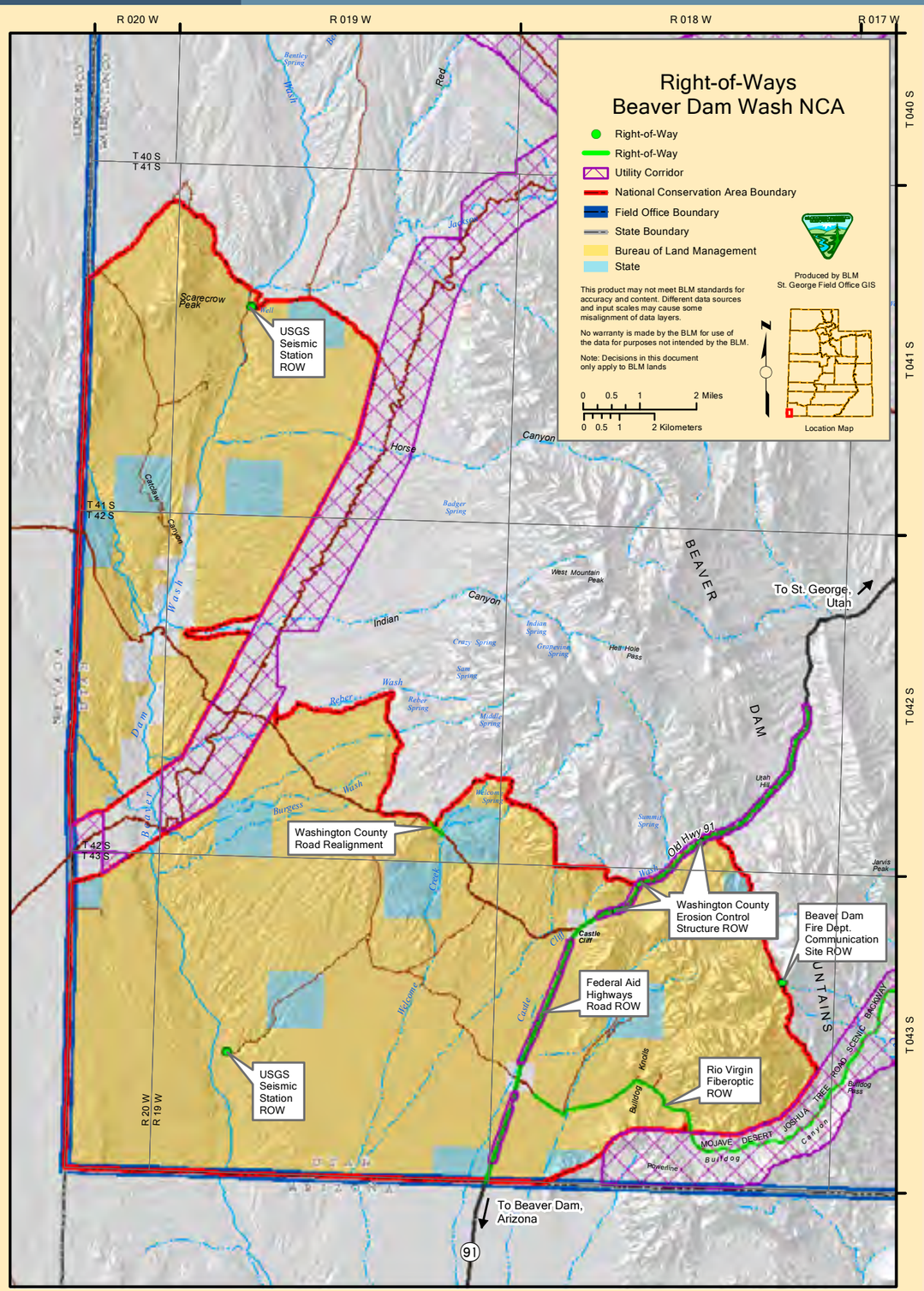
The SGFO administers approximately 629,000 acres of public lands in the far southwest corner of Utah. This acreage represents less than 40% of the total land base of Washington County, Utah.

3.21.1.1 Population Trends and Demographics

Washington County's population totaled 144,809 in 2012, with the City of St. George accounting for 52.2% of this total. Population growth (Photo 3-95) has far outpaced that of Utah and the United States as a whole, although the County's population growth has slowed somewhat recently compared to previous decades. The population is 93.9% white, which is slightly higher than the state-wide percentage. Over 18% of the population is aged 65 or older, which is twice the percentage for all other counties in the state, and appears to reflect the popularity of greater St. George area as a retirement destination. Approximately 91% of the population age 25 and over have a high school education or higher, with over 25% of the population holding an undergraduate degree or higher. (U.S. Census Bureau 2014).

"Washington County's population totaled 144,809 in 2012, with the City of St. George accounting for 52.2% of this total."

Photo 3-95 Population Growth on the Edge of Red Mountain Wilderness, Red Cliffs NCA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WASHINGTON CO
NEVADA
UTAH
ARIZONA
Right-of-Ways
Beaver Dam Wash NCA
Right-of-Way
Right-of-Way
Utility Corridor
National Conservation Area Boundary
Field Office Boundary
State Boundary
Bureau of Land Management
State
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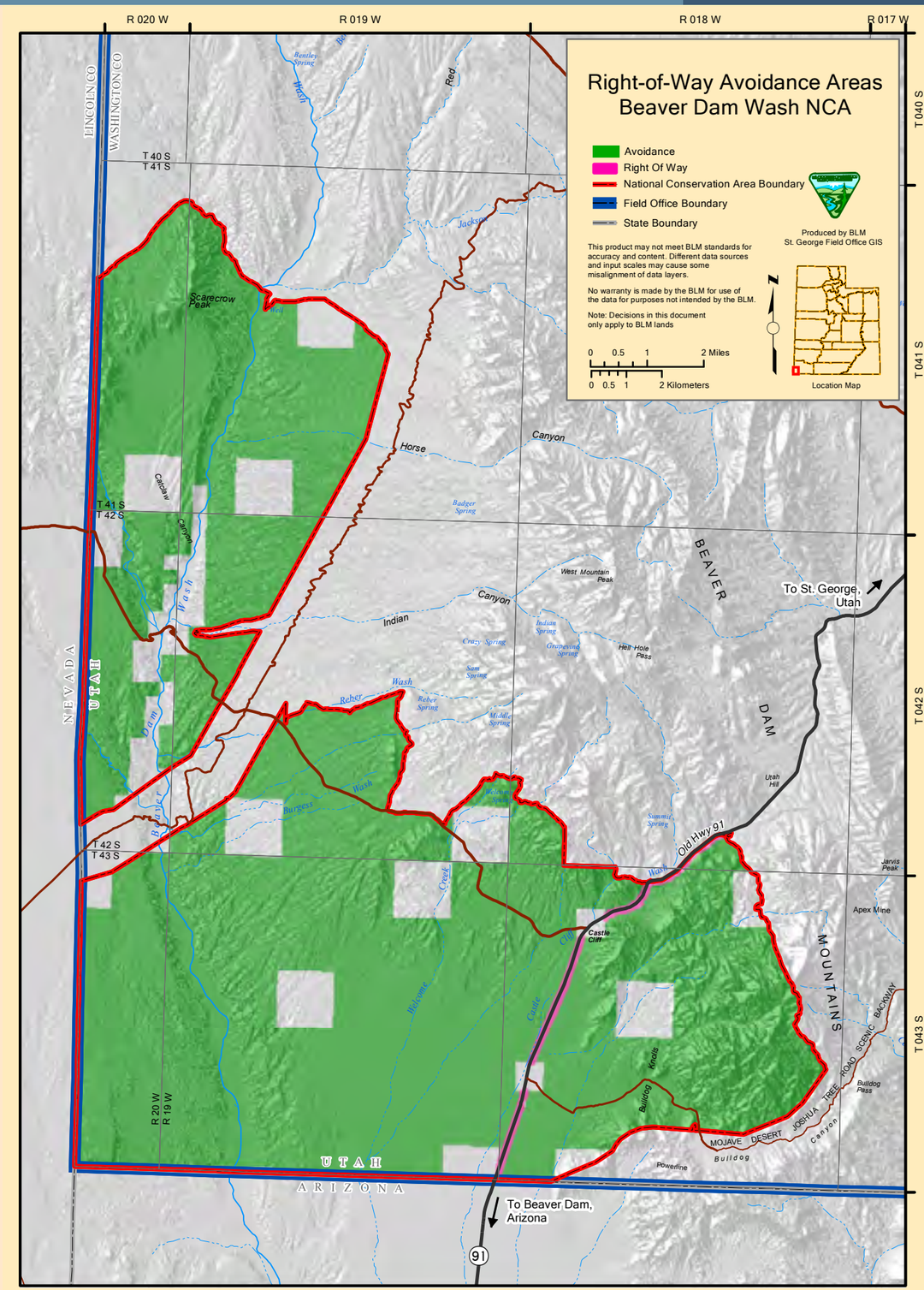
Location Map
USGS Seismic Station ROW
Washington County Road Realignment
Washington County Erosion Control Structure ROW
Beaver Dam Fire Dept. Communication Site ROW
Federal Aid Highways Road ROW
Rio Virgin Fiberoptic ROW
USGS Seismic Station ROW
To St. George, Utah
To Beaver Dam, Arizona
Scarecrow Peak
Bentley Spring
Wash
Red
Jackson
Horse
Canyon
Catclaw
Canyon
Badger Spring
West Mountain Peak
BEAVER
DAM
Indian
Canyon
Indian Spring
Crazy Spring
Grapevine Spring
Hell Hole Pass
Sam Spring
Wash
Reber
Reber Spring
Middle Spring
Dam
Beaver
Burgess
Wash
Welcome Spring
Summit Spring
Utah Hill
Old Hwy 91
Wash
Jarvis Peak
Creek
Cliff
Castle Cliff
Welcome
Castle
Knolls
Bulldog
Bulldog Pass
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
Canyon
Powerline
Bulldog
MOUNTAINS
Apex Mine
91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LINCOLN CO
WASHINGTON CO
NEVADA
UTAH
ARIZONA
Right-of-Way Avoidance Areas
Beaver Dam Wash NCA
Avoidance
Right Of Way
National Conservation Area Boundary
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Location Map
To St. George, Utah
To Beaver Dam, Arizona
Scarecrow Peak
Bentley Spring
Wash
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Jackson
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Canyon
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Utah Hill
Old Hwy 91
Wash
Jarvis Peak
Creek
Cliff
Castle Cliff
Welcome
Castle
Knolls
Bulldog
Bulldog Pass
MOJAVE DESERT JOSHUA TREE ROAD SCENIC BACKWAY
Canyon
Powerline
Bulldog
MOUNTAINS
Apex Mine
91

"BLM identified distinctive categories of stakeholders that could be affected by decisions made in the RMP and Amendment planning processes."

3.21.1.2 Social Values and Attitudes

Different types of stakeholders have distinct sets of attitudes, beliefs, values, opinions, and perceptions about public resources and the effects of various management policies and actions. These views reflect different cultural, as well as economic, linkages people have to public lands. During the scoping process for this planning effort and through an Economic Strategies Workshop held in February of 2011 in St. George, BLM identified distinctive categories of stakeholders that could be affected by decisions made in the RMP and Amendment planning processes. These categories and their descriptions are based primarily on comments made during the public scoping period and at the Economic Strategies Workshop. The stakeholder categories identified by this process include the following:

- Habitat and resource conservation stakeholders
- Motorized recreation stakeholders
- Non-motorized recreation stakeholders
- Livestock grazing stakeholders
- Economic development stakeholders (Photo 3-96)

The categorization of stakeholders is not meant to imply that all individuals and social groups fit neatly into a single category; many specific individuals or organizations may have multiple interests and would see themselves reflected in more than one stakeholder category. The point of categorization is to facilitate the impacts analysis phase of the planning processes, by allowing differentiation of social impacts based on broad differences in sociocultural linkages to public lands and the associated points of view of various stakeholders.

3.21.1.3 Employment and Income

As of 2012, annual per capita personal income in Washington County was $28,597, which is lower than the statewide estimate of $35,430. Of the Washington County total, approximately $13,976 (48.9%) represents non-labor income, which is considerably higher than the State of Utah or U.S. national average. This may reflect the significantly higher percentage of older and retired residents who live in the County. Unemployment averaged 7% for 2012, although the seasonally adjusted rate had dropped to 5.3% by October, 2013. The percentage of the population living at or below the poverty level averaged 14.5%

Photo 3-96 Economic Development Stakeholder: Municipal Parks and Recreation

over the period between 2008 and 2012, somewhat higher than the state average of 12.1%. (Bureau of Economic Analysis 2014; Utah Department of Workforce Services 2014; U.S. Census Bureau 2014).

3.21.1.4 Major Employment Sectors

Table 3-29 provides data on employment by major sectors for Washington County, excluding data on those who are self-employed or employed in the agricultural sector.

3.21.1.5 Public Finance

Public lands and federal mineral estate management can affect local, county, state, and federal government budgets, based on accruals from mineral royalties, property taxes, Payments in Lieu of Taxes (PILT), fees, and other revenues. Likewise, public lands and federal estates result in federal government expenditures for management, law enforcement, and other activities that directly and indirectly provide revenues to local and state budgets. Table 3-30 summarizes some of the tax receipts accruing to Washington County, a portion of which can be attributed to activities on BLM-managed public lands.

3.21.1.6 Public Land Uses and Value

Public lands and resources provide many socioeconomic benefits and opportunities to local residents. These resources include:

- Vegetative products (e.g., firewood, posts, native seeds)
- Livestock Grazing
- Recreation
- Lands and Realty
- Minerals and Energy
- Special Designations
- Tribal Uses
- Nonmarket Values

"Public lands and federal mineral estate management can affect local, county, state, and federal government budgets, based on accruals from mineral royalties, property taxes, Payments in Lieu of Taxes (PILT), fees, and other revenues."

Table 3-29 Employment by Major Economic Sectors for Washington County, June 2013

Sector[1]	Number Employed	Percentage Of Total
Mining, Construction and Manufacturing	7,059	13.7
Trade, Transportation, and Utilities	11,870	23.0
Information and Financial Activities	2,282	4.4
Professional and Business Services	4,141	8.0
Educational, Health and Social Services	8,688	16.9
Leisure and Hospitality	8,189	15.9
Other Services	1,514	2.9
Government	7,654	14.7
Agriculture Forestry, Fishing & Hunting[2]	101	0.01
Total	51,498	100 (rounded)

[1]Excludes data on self-employment and the agriculture sector.
[2]Employment covered under the Employment Security Act.

Source: Utah Department of Workforce Services accessed January 10, 2014

Table 3-30 Tax and Other Revenues Paid to Washington County, Federal Fiscal Year 2012

Source	Local Sales Tax Distribution	County Option Sales Tax	Property Taxes	Other[1]	Natural Resources	Pilt[2]
FY 12 Dollars	$21,479,131	$5,428,704	$131,348,612	$8,041,043	$507,935	$2,717,957

[1]Includes Restaurant, Leasing, County Transient Room, and Municipal Highways Taxes
[2]Source: U.S. Department of Interior, accessed January 14, 2014, FY13 dollars

Source: Utah Tax Commission (FY2012), accessed January 13, 2014; USDOI (for PIL)

"Environmental justice concerns include any adverse effect on minority and low-income populations in the study area."

The Socioeconomic Baseline Report provides details on the social and economic contributions of these resources for Washington County as a whole, and also specifically for the Red Cliffs and Beaver Dam NCAs.

3.21.1.7 Environmental Justice

Executive Order 12898, dated February 11, 1994, established the requirement to address environmental justice concerns within the context of federal agency operations:

> To the greatest extent practical and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and averse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States.

As part of the NEPA process, agencies are required to identify and address disproportionately high and adverse human health or environmental effects on minority and low-income communities. Six general principles for environmental justice under NEPA include:

1. Identify minority and low-income populations in the area affected by the project;
2. Consider relevant public health data and industry data regarding potential multiple and cumulative exposures of minority and low-income populations to human health or environmental hazards;
3. Recognize interrelated cultural, social, occupational, historical, or economic factors that could amplify environmental effects of the project;
4. Develop effective public participation strategies that overcome linguistic, cultural, institutional, geographic, and other barriers;
5. Assure meaningful community representation in the process; and
6. Seek tribal representation consistent with the government-to-government relationship between the United States and tribal governments.

Environmental justice concerns include any adverse effect on minority and low-income populations in the study area. Key indicators reviewed for environmental justice include minority populations, poverty rates, and income within a community.

Based on the available data and the definitions and threshold values noted above, on the basis of minority population, no places in Washington County are flagged as areas of potential concern for impacts to environmental justice populations. On the basis of poverty status, Hildale City is flagged as an area of potential concern for impacts, due to the high percentages of its population of all ages, its population of related children under 18 years, and families that are living under the poverty level.

With respect to the American Indian population in Washington County, this population does not show up as a high percentage of the population in any of the identified places in the county. Further, it is known that relatively few members of the Shivwits Band of Paiutes live on the Shivwits Reservation, which consists of largely undeveloped, remote lands. Many members of the Shivwits Band live in local communities and do not make up a large part of any single community's population.

However, further consideration is warranted given the CEQ guidance regarding Indian tribes. According to the 2006–2010 American Community Survey (ACS) (Table S1701), 1,521 individuals in Washington County identify as either American Indian or Alaskan Native. Of these, 670 individuals (44%) are living in poverty. Although the margin of error given the sample size is high (the

Photo 3-97 Socioeconomic Benefits in Beaver Dam Wash NCA: Recreation

percentage could be between 24 and 64%), it is clear that the poverty rate among this population is much higher than that of other Washington County populations as a whole (9.8%). Therefore, the American Indian population in Washington County is identified as a potential environmental justice population of concern.

3.21.2 Beaver Dam Wash NCA Social and Economic Conditions

As part of the overall economic benefits to the planning area discussed above, the NCA provides potential socioeconomic benefits in the following resources:

- Grazing on portions of four allotments (2,590 permitted AUMs);
- Recreation, primarily dispersed (8,890 visits in 2013) (Photo 3-97).

3.21.3 Health and Safety

There has not been a systematic inventory of abandoned mines (Photo 3-98) in the Beaver Dam NCA. There are seven known mines within the NCA and remediation has not been conducted on these sites. With a systematic inventory, it is likely that more abandoned mines will likely be discovered that will require remediation actions. There are no known above ground or underground storage tanks or locations with hazardous wastes on public lands in the NCA.

Photo 3-98 Recently Discovered Abandoned Mine in Red Cliffs NCA

"As economists and academics in related fields, we believe that federal protected public lands are essential to the West's economic future. These public lands, including national parks, wilderness areas and national monuments, attract innovative companies and workers, and are an essential component of the region's competitive advantage. . . . [T]he U.S. is now predominantly a service-based economy, and the fastest-growing regions are those that have been able to attract talented workers, entrepreneurs, and investors across all sectors of the economy. In the West especially, public lands play a pivotal role in attracting and retaining people and businesses."
–Letter to the President from 100 Economists and Academics, November 30, 2011

Chapter 3: Affected Environment RCNCA

3.22 INTRODUCTION

This section describes the ecosystem resources (geological, biological, and cultural values) and the socioeconomic characteristics of the Red Cliffs NCA that could be affected by implementation of the alternatives presented in Chapter 2. The descriptions provide information about the legal and regulatory framework that applies to each resource value or use, as well as past and current management practices. Where specific information about resource conditions or uses is not available for the NCA, the best available county-wide or regional data are used.

Because many of the resource values and land uses in Red Cliffs NCA are similar to those in the Beaver Dam Wash NCA, the descriptions of those values and uses are not repeated here. As an example, the reader is referred to the descriptions of the life histories and habitat requirements in the Affected Environment for Beaver Dam Wash NCA for many species that are found in both NCAs. Where there are differences in population trends, habitat conditions, or other factors for species in the Red Cliffs NCA, when compared to the Beaver Dam Wash NCA, these are described in this section.

3.23 AIR QUALITY

The reader is referred to the description of air quality in the Affected Environment for Beaver Dam Wash NCA for information on ambient air quality in Washington County. Data collected from the two UDAQ monitoring stations, displayed in Table 3-1, indicate that air quality in the greater St. George urban area is good (Photo 3-99). As Red Cliffs NCA is adjacent to this urban area, and within the annexation boundaries of the five largest communities in the St. George Basin, the data on air quality collected from the UDAQ monitoring stations are applicable to the NCA.

3.23.1 Climate

Climatic conditions are influenced by the location of the NCA at the convergence of three ecoregions: the Mojave Desert, Great Basin Desert, and the Colorado Plateau. The average annual precipitation is approximately 14 inches at elevations above 5,500 feet, slightly higher than in the Beaver Dam Wash NCA, and the

Photo 3-99 View of West Mountain Peak, 19 Miles from Red Cliffs NCA

"Who will tell whether one happy moment of love or the joy of breathing or walking on a bright morning and smelling the fresh air, is not worth all the suffering and effort which life implies."

–Erich Fromm, Psychologist, 1900–1980

Photo 3-100 Winter Storm in Red Cliffs NCA

"Water is the driving force of all nature"
–Leonardo da Vinci, Artist, 1452–1519

area receives snowfall more regularly (Western Regional Climate Center 2014) (Photo 3-100). Data collected from monitoring sites in St. George, Utah indicate that the average annual temperature is approximately 61° F. Winter temperatures average approximately 42° F, while the average summer temperature is 81° F. The average wind speed recorded (in St. George) was 2.1 miles per hour for the year; the prevailing wind direction is predominantly from the west in the summer and from the east in the winter (Community Environmental Monitoring Program 2008).

3.23.2 Climate Change Scenarios

The reader is referred to the description of climate change scenarios in the Affected Environment for Beaver Dam Wash NCA, as these scenarios would be applicable to the Red Cliffs NCA.

3.24 WATER RESOURCES

3.24.1 Hydrologic Units

Map 3-29 displays the hydrologic units that overlap in the NCA. The landbase east of the Cottonwood Road is within the Gould Wash-Virgin River watershed, while the remainder of the NCA is located with the Lower Santa Clara River watershed. Both watersheds drain to and recharge the Virgin River system, through its major and minor tributaries.

3.24.2 Water Resources

The reader is referred to the Affected Environment for Beaver Dam Wash NCA for a discussion of water resource management by the State of Utah (through UDEQ), pursuant to the federal CWA.

3.24.3 Surface Water

Leeds and Quail Creeks, the Virgin River, and numerous ephemeral washes (Photo 3-101) comprise the primary surface water sources of the NCA (Map 3-30).

Leeds and Quail Creeks (Photo 3-102 and Photo 3-103) are shallow streams whose headwaters are springs in the Pine Valley Mountains. Snowmelt from the Pine Valley Mountains and seasonal precipitation events increase the volume of flows for each stream. Leeds Creek is perennial through the NCA, while Quail Creek is today an intermittent stream, as water is diverted for irrigation purposes upstream on private lands. The confluence of Leeds and Quail Creeks is within in the NCA, approximately 0.65 mile north of I-15 and 2 miles south of the community of Leeds, Utah. Data from a United States

Photo 3-101 Ephemeral Wash in Red Cliffs NCA

"Leeds and Quail Creeks, the Virgin River, and numerous ephemeral washes comprise the primary surface water sources of the Red Cliffs National Conservation Area."

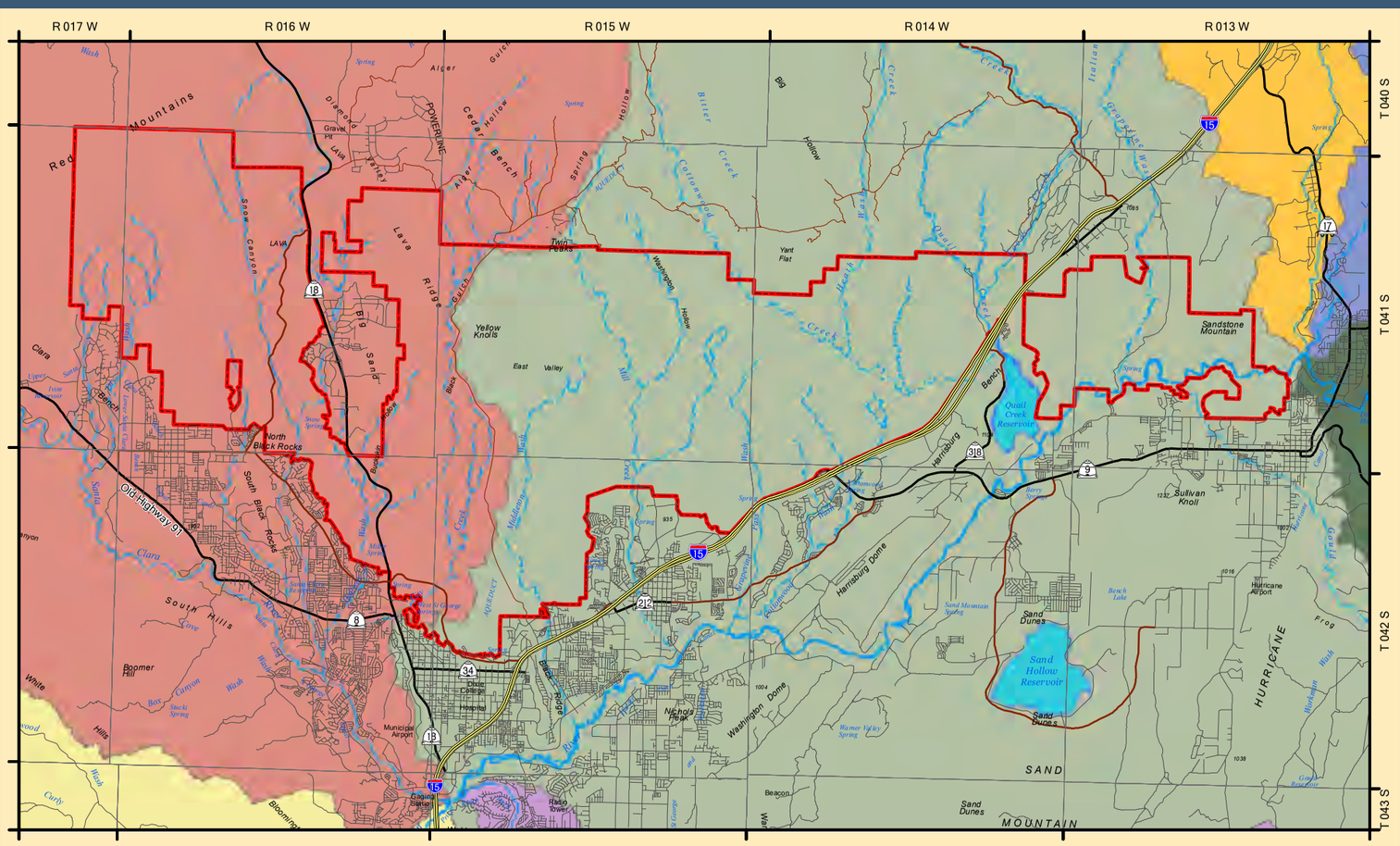
Photo 3-102 Leeds Creek, Red Cliffs NCA

Photo 3-103 Quail Creek, Red Cliffs NCA

Geological Survey (USGS) stream flow gage on Leeds Creek indicate that flows are highly variable, from as little as 8 cfs to as much as 4,420 cfs; similar data are not available for Quail Creek.

Water quality data for Leeds Creek is collected by UDEQ at a location near the community of Leeds. According to a recent UDEQ Water Quality Standards Exceedance Report (February 4, 2010), the levels of phosphorus detected in Leeds Creek have exceeded the acceptable range for the identified beneficial use classes for this stream: Agriculture (4) and Cold Water Species (3A). Other water quality parameters for Leeds Creek were within the acceptable limits.

Stream flows from Quail Creek are seasonally diverted, leaving little or surface water in the channel through the



Watersheds - Red Cliffs NCA

Hydrologic Unit Boundary
- Ash Creek
- Black Rock Gulch-Lower Virgin River
- Fort Pearce Wash (Local Drainage)
- Gould Wash-Virgin River
- La Verkin Creek
- Lower Santa Clara River
- North Creek-Virgin River
- National Conservation Area Boundary

Source: U. S. Department of Agriculture, Natural Resources Conservation Service: Watershed Boundary Datasets (WBD) - Level 10

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No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

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Note: Decisions in this document only apply to BLM lands

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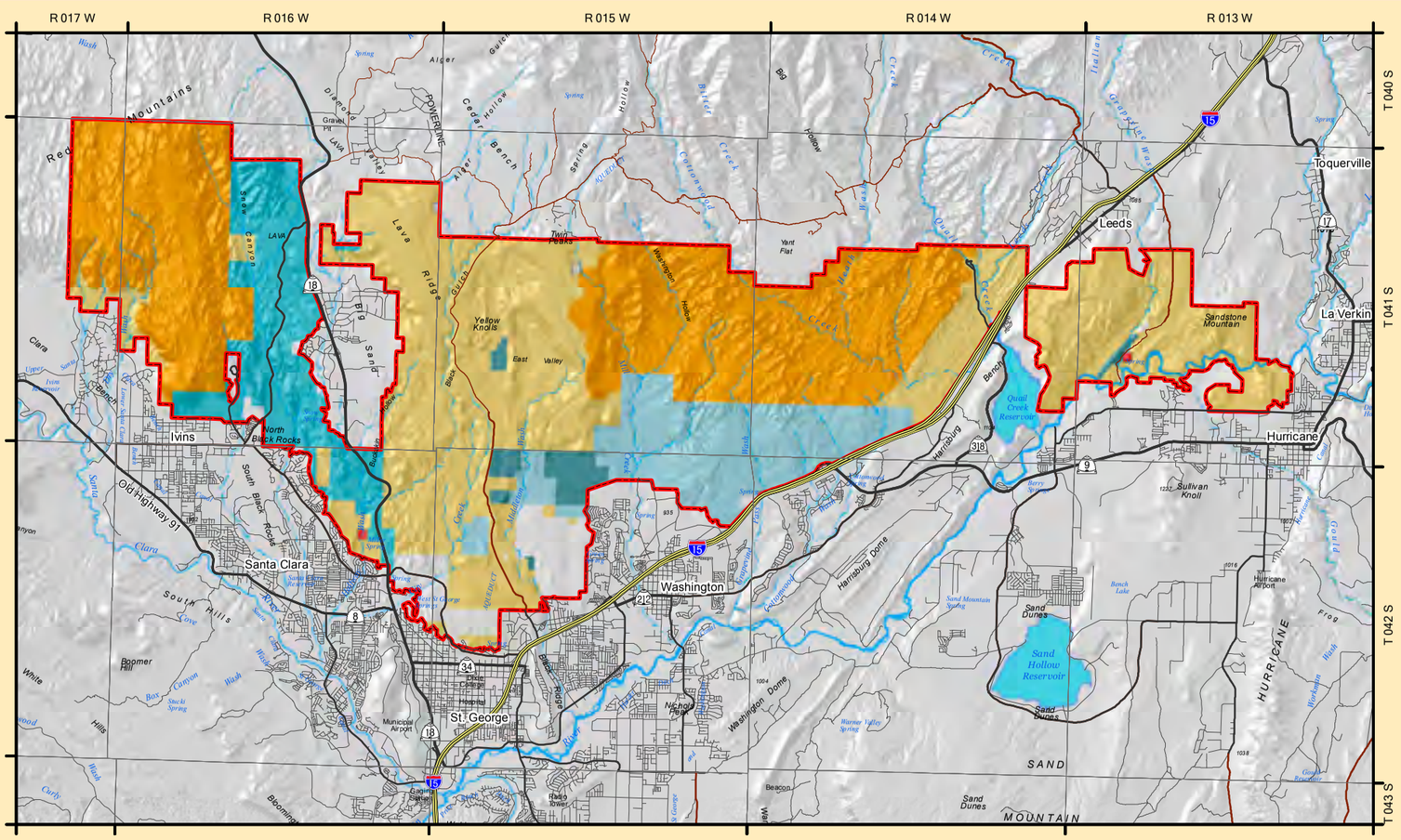
Location Map



Natural & Developed Water Sources - Red Cliffs NCA

- Spring
- Guzzler
- Livestock Trough
- National Conservation Area Boundary
- BLM Wilderness Area
- Bureau of Land Management (BLM)
- State
- State Parks and Recreation
- State Wildlife Reserve/Management Area

Source: U.S. Geological Survey, 1999, National Hydrography Dataset (NHD): Reston, VA: Springs NHD High Resolution

This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

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N

Location Map

"The Virgin River flows for approximately six miles through the Red Cliffs National Conservation Area."

Photo 3-104 Virgin River Flowing Through the Red Cliffs NCA

NCA during the late spring and summer months. Because this stream is intermittent on public lands, BLM does not currently collect water quality data for Quail Creek.

The Virgin River (Photo 3-104) flows for approximately six miles through the NCA. The river's headwaters are located north of Zion National Park on the Dixie National Forest. The volume of water carried by the Virgin River is augmented by many large and small tributaries as it flows southwesterly through Washington County, the Arizona Strip, and southern Nevada to the Colorado River. Along its 162 mile length, the Virgin River provides habitats for unique plant and animal species, some of which are endemic to southwestern Utah and this river system. A number of these species are found within the NCA and are described under Section 3.32 Special Status Species.

The Virgin River segments and tributaries that flow in and out of Zion National Park were Congressionally-designated to the National System of Wild and Scenic Rivers through OPLMA Section 1976. Approximately 19 miles of designated river segments are managed by BLM; none of these segments are located within the Red Cliffs NCA.

The water quality of various reaches of the Virgin River, including the short segment through the NCA, is impaired by the naturally occurring high levels of total dissolved solids (TDS), the sources of which are primarily geologic. Reaches of the river below Pah Tempe Spring (near Hurricane, Utah) are listed on the State of Utah's Section 303(d) list of impaired waters (Environmental Protection Agency 2010) for the identified beneficial use of Agriculture (4) (UDEQ 2004).

3.24.3.1 Springs and Seeps

The public lands of the NCA have not been systematically inventoried to identify all springs and seeps, so data on these resources is currently incomplete. An unnamed spring near Grapevine Wash is located on public land (Sec. 30, T. 41S, R. 13W, SLBM) at the location shown on Map 3-30; the water rights for this spring are not held by BLM.

3.24.4 Ground Water

The groundwater aquifer created by the Navajo Sandstone Formation (Photo 3-105) and underlying Kayenta

Photo 3-105 Pothole in Navajo Sandstone Formation, Red Cliffs NCA

Formation is the primary source of potable water for the municipalities of the St. George Basin. These two geologic units underlie the NCA and allow the accumulation of ground water because of the porous spaces between the sand grains. Much of the water volume is transported along fractures and faults in the rock units. Although water quality in the Navajo/Kayenta aquifer is extremely variable, the aquifer is capable of yielding usable quantities of water suitable for most agricultural and domestic uses (Heilweil, et al. 2000).

3.24.5 Water Rights and Beneficial Uses

The BLM holds three perfected water rights for recreational uses in the NCA, with these rights being used as shown on Table 3-31.

A 65 foot deep well (Water Right #81-808) was drilled in 1969 to provide water to the developed Red Cliffs Recreation Area campground and day use area. It was plugged in 1996, because high bacteria levels were consistently detected in the groundwater from this shallow well. Culinary water for use in the Recreation Area is now purchased by BLM from the City of Hurricane and supplied via a pipeline linked to the City's municipal water system.

3.25 GEOLOGIC AND PALEONTOLOGICAL RESOURCES

3.25.1 Physiography

The NCA is within a complex physiographic Transition Zone between the Great Basin section of the southern Basin and Range Province and the Colorado Plateau, at the northern edge of the St. George Basin. The St. George Basin is a topographic depression bounded on the east by the Hurricane Cliffs, on the west by the Beaver Dam Mountains, and on the north by the Pine Valley Mountains. The Virgin River flows from east to west through the St. George Basin, and is fed by several major tributaries, the largest of

Table 3-31 BLM Water Rights in Red Cliffs NCA

Water Right	Source	Date Filed (F) Priority (P)	Action Date	Area Served	Location	Flow
81-2830	Unnamed Wash	1856 (P)	10/16/86	Red Cliffs Recreation Area	NW1/4 of NE1/4, Sec. 23, T. 41S, R. 14W, SLBM	8.0 acre feet
81-565	Underground Water Well	4/30/1963 (F) 1963 (P)	8/7/63	Red Cliffs Recreation Area	SE1/4 of NE1/4, Sec. 15, T. 41S, R. 14W, SLBM	0.0008 cfs
81-808	Underground Water Well	11/16/1965 (F) 1965 (P)	3/28/66	Red Cliffs Recreation Area	SE1/4 of NE1/4, Sec. 15, T. 41S, R. 14W, SLBM	0.01 cfs
Source: Utah State Engineers Records 2012						

"Geology is part of that remarkable dynamic process of the human mind which is generally called science and to which man is driven by an inquisitive urge. By noticing relationships in the results of his observations, he attempts to order and to explain the infinite variety of phenomena that at first sight may appear to be chaotic."
–Reinout Willem van Bemmelen, Geologist, 1904–1983

"Happy the man whose lot is to know the secrets of the Earth."
–Euripides, Greek Playwright, 480–406 BC

which is the Santa Clara River. Elevations in this NCA range from about 2,900 feet ASL near the Virgin River to over 5,000 feet ASL along its north boundary with the Dixie National Forest.

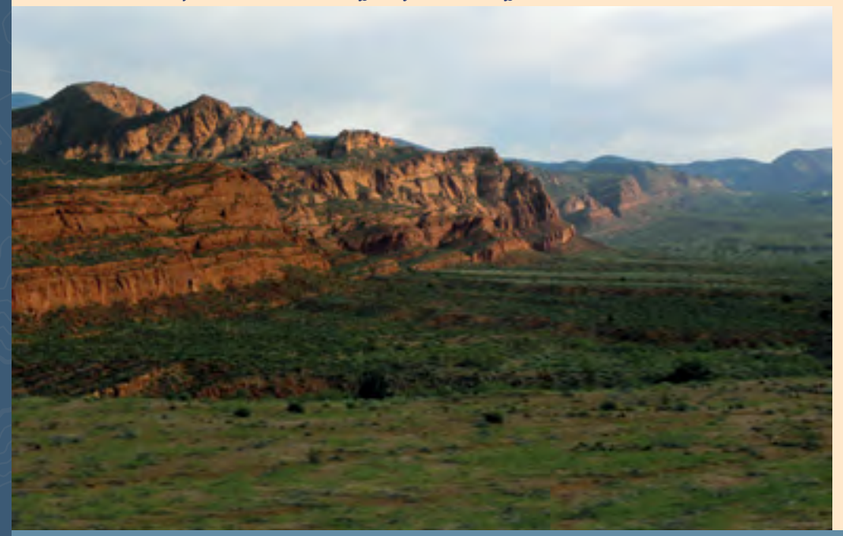
The dominant topographic feature of the NCA is a nearly 18 mile long northern backbone of Navajo Sandstone, deposited as sand dunes nearly 200 MYA. Massive outcrops of this primarily reddish-orange sandstone have eroded into the steep-sided cliffs (the "red cliffs" from which the NCA derives its name) (Photo 3-106), canyons, and hoodoos that typify the Cottonwood Canyon and Red Mountain Wilderness areas. It also underlies Snow Canyon State Park, located within the western boundaries of the NCA, as a nearly horizontal 2,000 foot thick rock layer. As the land base of the NCA descends in elevation into the St. George Basin, the topography changes to broad, dissected alluvial fans, dotted with volcanic cones and Quaternary age basalt flows.

3.25.2 Geologic Structure

The Transition Zone contains structural characteristics of both physiographic provinces and includes the leading edge of the Sevier Orogeny thrust belt, a Cretaceous to early Tertiary age compressional event that dates between 140 and 50 MYA (Armstrong 1968). Thrust faulting and folding during the Sevier Orogeny formed a prominent structural feature in the Transition Zone: the northeast trending Virgin anticline. The Transition Zone also is characterized by a series of late Cenozoic, north-trending, west-dipping normal faults, as well as the Hurricane Fault, the Washington Fault, and the Grand Wash Fault (which bounds the fault blocks that "step down" from the Colorado Plateau into the southern Basin and Range Province).

The strata in the western and central areas of the NCA are generally characteristic of the flat-lying, sedimentary rock units of the Colorado Plateau. By contrast, the rocks in the eastern part of the NCA, in the White Reef and East Reef/Babylon areas, are faulted and folded as part of the northeast trending Virgin anticline. The folded sandstone units were more resistant to erosion and formed the cuestas (or "hogbacks") that are today exposed in the eastern portions of the NCA. Four mineralized sandstone cuestas, called "reefs" by local residents, contained uncommon ore-grade deposits of silver-chloride that were mined in the mid-19th to early 20th century Silver

Photo 3-106 Navajo Sandstone "Red Cliffs" of the Red Cliffs NCA



Reef Mining District (Biek and Rohrer 2006). This district produced over eight million dollars in silver ore during its brief boom period. The East Reef and a portion of the White Reef are located within the NCA.

OPLMA Section 1974 (g) withdrew the public lands of the NCA to all forms of location, entry, and patenting under the general mining laws, subject to valid existing rights. Eight 20-acre lode mining claims were active at the time of NCA designation. These include: Black Knoll (UMC361596), Sand Ridge (UMC361601), Rattlesnake #2-3 (UMC361598-361599), and Vanderbuilt #1-4 (UMC361602-361605), all located in the East Reef /Babylon area (Sec. 17 and 20, T. 41S, R. 13W). To develop these claims, the claimholders must comply with the regulatory requirements outlined at 43 CFR 3809 and 3715.

3.25.3 Geologic Formations

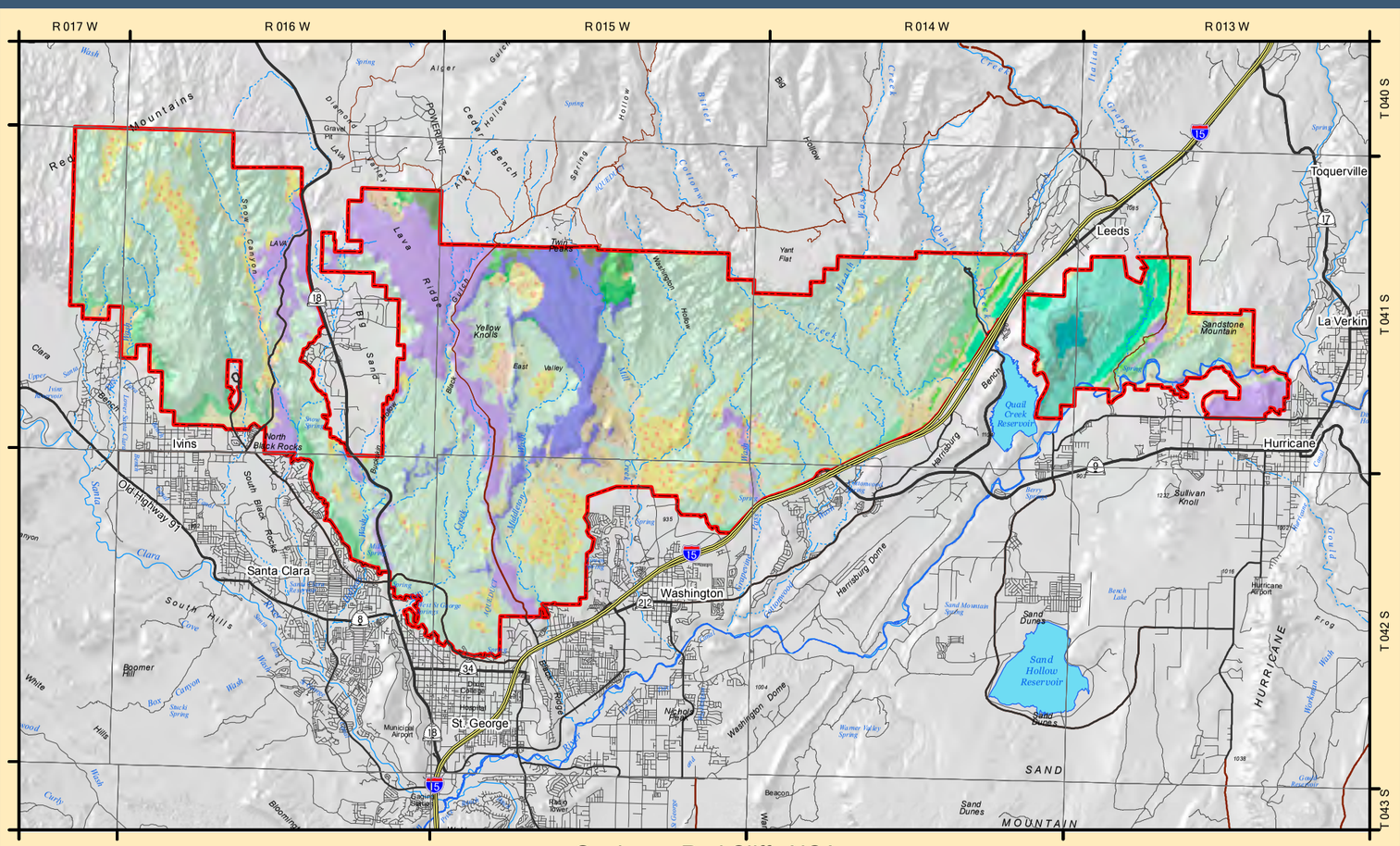
Map 3-31 displays the geological units that are exposed in the NCA. The dominant formation of the NCA is the 2,500 foot thick Navajo Sandstone Formation, exposed over more than 60% of the NCA land base. Rocks that normally would overlie the Navajo Sandstone, including marine Jurassic age sedimentary rocks, Cretaceous and early Tertiary sedimentary rocks, and middle Tertiary volcanic rocks, have been removed by erosion. More recent geologic formations of the NCA were primarily formed by Basin-Range tectonism that began about 20 MYA (late Tertiary). Basalt flows and associated cinder cones can be observed in approximately 14% of the NCA. Surficial deposits, consisting primarily of eolian sand deposits, cover another 17% of the NCA area.

3.25.3.1 Moenkopi Formation

The oldest rock unit in the NCA is the Triassic age Moenkopi Formation, exposed along the eroded axis of the Virgin anticline near the East Reef (Photo 3-107). The exposed Moenkopi consists of the Shinabkaib Member and the Upper Red Member. The Shinabkaib Member is made of gypsiferous pale red to reddish-brown mudstone and siltstone, resistant white to greenish-gray gypsum, and lesser, thin, laminated, light gray dolomite beds; it forms characteristic "bacon striped" ledgy slopes. The Upper Red Member consists of interbedded reddish-orange to reddish-brown siltstone, mudstone, and fine grained sandstone. These members record tidal flat and coastal sabkha depositional environments.

Photo 3-107 Moenkopi Formation in Little Purgatory Near the East Reef

"Nature never hurries. Atom by atom, little by little she achieves her work."
–Ralph Waldo Emerson, Essayist, 1803–1882



Geology - Red Cliffs NCA

Geology Units

Qa, Qat, Qaf1, Qafo, Qc, Qes, Qeo, Qmt, Qms, Qac, Qea, Qae, Qaeo, Qb, Qbs, Qbrt, Qbrtc, Qbcp, Qbcpc, Qber, Qberc, Qbv, Qblc, Qbw, Qbwc, Qbb, Qbcb, Qbl, Tbt, Tbtc, Ki, Jcx, Jcc, Jts, Jn, Jk, Jks, JTRm, TRcp, TRcs, TRmu, TRms

Water

National Conservation Area Boundary

Source: Utah Geological Survey Map 242, 1:100k Scale, Biek et al., 2009

This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.

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Note: Decisions in this document only apply to BLM lands

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

Location Map

Geologic Formations
Red Cliffs NCA

- Qa - River and stream deposits
- Qat - Old river and stream deposits
- Qaf1 - Level-1 alluvial-fan deposits
- Qafo - Older alluvial-fan deposits
- Qc - Colluvial deposits
- Qes - Eolian sand deposits
- Qeo - Older eolian sand deposits
- Qmt - Talus deposits
- Qms - Landslide deposits
- Qac - Alluvial and colluvial deposits
- Qea - Eolian and alluvial deposits
- Qae - Alluvial and eolian deposits
- Qaeo - Older alluvial and eolian deposits
- Qb - Basaltic lava flows, undivided
- Qbs - Santa Clara lava flow
- Qbrt - Radio tower lava flow
- Qbrtc - Radio tower cinder cones
- Qbcp - Cinder pits lava flow
- Qbcpc - Cinder pits cinder cones
- Qber - East Reef lava flow
- Qberc - East Reef cinder cones
- Qbv - Volcano Mountain lava flow
- Qblc - Little Creek lava flow
- Qbw - Washington lava flow
- Qbwc - Washington cinder cone
- Qbb - Big Sand lava flow
- Qbcb - Cedar Bench lava flow
- Qbl - Lava Ridge lava flow
- Tbt - Twin Peaks lava flow
- Tbtc - Twin Peaks cinder cones
- Ki - Iron Springs Formation
- Jcx - Crystal Creek Member of Carmel Formation
- Jcc - Co-op Creek Limestone Member of Carmel Formation
- Jts - Sinawava Member of Temple Cap Formation
- Jn - Navajo Sandstone
- Jk - Kayenta Formation
- Jks - Springdale Sandstone Member
- JTRm - Moenave Formation
- TRcp - Petrified Forest Member of Chinle Formation
- TRcs - Shinarump Conglomerate Member of Chinle Formation
- TRmu - Upper red member of Moenkopi Formation
- TRms - Shnabkaib Member of Moenkopi Formation

Source: Utah Geological Survey Map 242, 1:100k Scale, Biek et al., 2009

"Beneath all the wealth of detail in a geological map lies an elegant, orderly simplicity."
–Tuzo Wilson, Geologist and Geophysicist, 1908–1993

3.25.3.2 Chinle Formation

Overlying the Moenkopi Formation is the Upper Triassic age Chinle Formation, consisting of the Shinarump Conglomerate Member and the Petrified Forest Member. The Shinarump Conglomerate Member is about 100-150 feet thick, and forms a prominent cuesta along the flanks of the Virgin anticline in the Little Purgatory area (Photo 3-108). It is a typically light gray to yellowish-brown, fine to coarse sandstone, locally grading into lenticular pebble conglomerate near the base. It is commonly heavily stained by iron-manganese oxides as liesegang banding, and typically contains poorly preserved petrified wood and plant fragments, also replaced in part by iron-manganese oxides. A significant fossil site was discovered in the NCA in 2007 that contained rare impressions of several plant species including ferns (Photo 3-109) and conifers.

The Petrified Forest Member of the Chinle Formation consists of 400 foot thick sections of variable-colored mudstone, claystone, siltstone, and minor chert and nodular limestone. The purple, grayish-red, greenish-gray, reddish-brown, and olive-gray mudstones and claystones are easily eroded, poorly exposed (typically), and present in valleys and low areas. These mudstones contain bentonitic or swelling clays that weather to a rough "popcorn" surface. Locally well silicified and colorful petrified wood is common in the member. The Shinarump Conglomerate Member was deposited in a braided-stream environment, whereas Petrified Forest Member sediments were deposited in floodplain, lake, and stream environments.

3.25.3.3 Moenave Formation

The Lower Jurassic to Upper Triassic Moenave Formation consists of the Dinosaur Canyon Member and the Whitmore Point Member. The formation is only exposed in the eastern areas of the NCA, in the White Reef and East Reef/Babylon areas below the Springdale sandstone ridges. The Dinosaur Canyon Member consists of thin bedded, reddish-brown, fine grained sandstone and interbedded siltstone, and is about 150 feet thick. The overlying Whitmore Point Member is a greenish-gray claystone interbedded with pale brown to pale red thin bedded siltstone with several thin beds of light greenish-gray dolomitic limestone, and is about 50 feet thick. The Whitmore Point Member was deposited in floodplain and lake environments.

3.25.3.4 Kayenta Formation

Overlying the Moenave Formation is the Kayenta Formation. The Springdale Sandstone Member of the Kayenta Formation is exposed on the flanks of the eroded Virgin anticline in the White Reef and East Reef/Babylon areas. The Springdale Sandstone is a pale-reddish brown to grayish-yellow, fine to medium grained, planar to low-angle cross-bedded sandstone with minor interbedded light reddish-brown to greenish-gray mudstone and siltstone. The Springdale Sandstone was deposited in river channels and contains thin, discontinuous lenses of conglomerate, with mudstone and siltstone clasts and poorly preserved fossil plant remains. The Springdale Sandstone in the Silver Reef Mining District was the source of over 7 million ounces (220 metric tons) of silver-chloride that were mined prior to 1910 (Biek and Rohrer 2006). Copper and some uranium were also produced from the district.

The upper part of the Kayenta Formation conformably overlies the Springdale Sandstone Member and consists of a 925 foot thick sequence of reddish-brown siltstone and light purplish-red to pale reddish-brown mudstone with interbedded pale reddish-brown to pale red sandstone. The mudstone and siltstone are planar bedded and typically slope forming. The fine grained sandstone is usually calcareous and may contain small scale cross-bedding. Several poorly exposed

"The voyage of discovery lies not in finding new landscapes, but in having new eyes."
–Marcel Proust, French Novelist, 1871–1922

Photo 3-108 Prominent Cuesta in the Chinle Formation in Little Purgatory

Photo 3-110 Navajo and Kayenta Sandstone Formations of Red Mountain in Ivins

thin light gray dolomite beds are present. The upper part of the Kayenta Formation forms a deep red ledgy slope between cliffs of the Springdale Sandstone below and Navajo Sandstone above, and was deposited in river, distal river/playa, and minor lake environments.

3.25.3.5 Navajo Sandstone

The Navajo Sandstone consists of a basalt transition zone characterized by massive, resistant, cross-bedded sandstone separated by planar bedded, silty, fine grained sandstone with thin mudstone interbeds. The rest of the formation consists of the characteristic pale to reddish-orange

Photo 3-109 Fern Fossil from the Chinle Formation

"A stone is ingrained with geological and historical memories."
–Andy Goldsworthy, Artist, 1956–

Photo 3-111 Iron Springs Formation (top of distant peak) & Carmel Formation (on lower slopes) in the Red Cliffs NCA near the Dixie National Forest

Photo 3-112 Black Gulch Cutting through the Lava Ridge Basaltic Lava Flow

massive cross-bedded fine to medium grained sandstone of eolian origin. The Navajo Formation Sandstone is very uniform in composition as it consists of more than 90% quartz sand.

The Navajo Sandstone was formed in one of the world's largest coastal and inland paleo-dune fields, which covered much of modern day Utah and portions of adjacent states in the Early Jurassic. This highly jointed sandstone weathers to form bold rounded cliffs. Differential weathering accentuates the cross-bedding, and small vertical cracks give the unit its "checkerboard" or "elephant skin" look (Biek et al. 2009).

The overlying Middle Jurassic Temple Cap and Carmel Formations, and the Upper Cretaceous Iron Springs Formation are exposed only in a few scattered outcrops located in the north-central part of the NCA along the boundary with the Dixie National Forest (Photo 3-111).

3.25.3.6 Temple Cap Formation

The Temple Cap Formation, Sinawava Member, is a poorly exposed, slope-forming unit consisting of interbedded reddish-brown mudstone, siltstone, fine sandstone, and lesser gypsum. It was deposited in coastal sabkha and tidal flat environments.

3.25.3.7 Carmel Formation

The overlying Carmel Formation consists of the Co-op Creek Limestone Member and the Crystal Creek Member. The Co-op Creek Limestone Member is made of a gray micritic limestone and an upper sandy oolitic limestone that forms ledgy slopes and cliffs. The Crystal Creek Member is a poorly exposed, slope-forming unit that consists of reddish-brown gypsiferous siltstone, mudstone, sandstone, and gypsum. The Co-op Creek Limestone Member rocks are

Photo 3-113 Aeolian Surficial Deposits (foreground), Basalt Flow (middle ground)

"The Cedar Bench, Lava Ridge, and Big Sand basaltic lava flows and cinder cones that cover large areas in the central part of the Red Cliffs NCA have been dated from 1.1–1.5 million years old."

characteristic of shallow marine conditions while the Crystal Creek Member rocks were deposited in coastal sabkha and tidal flat environments.

3.25.3.8 Iron Springs Formation

The Upper Cretaceous Iron Springs Formation is a varicolored (grayish-orange to reddish-brown), calcareous, cross-bedded, fine to medium grained sandstone, siltstone, and mudstone. Although the formation was principally deposited in braided-stream and floodplain environments, the fossil evidence indicates that brackish water environments were present and that a Cretaceous seaway extended into this area during certain periods.

3.25.3.9 Basalt Flows and Cinder Cones

Black basaltic cinder cones and lava flows cover approximately 14% of the NCA. These flows are all younger than 2.5million years old; with the youngest one, near Diamond Valley, around 27,000 years old (Biek et al. 2009). Basalt flows and basaltic cinder cones are prominent features in this area. The youngest cones are still perfectly formed and have little vegetation, indicating their more recent development. Many of the lava flows now form inverted valleys, and are well-seen around the St. George area. As the lava flows blocked drainages in existing river channels, displaced streams moved off to the side of the lava flow where they eroded softer sedimentary bedrock, leaving the resistant lava flows stranded as elevated, sinuous ridges—inverted valleys—that mark the location of former channels.

The Twin Peaks lava flow and cinder cone is the oldest basaltic lava flow and erupted from Twin Peaks (along the NCA boundary with the Dixie National Forest) about 2.3 MYA. The Cedar Bench, Lava Ridge (Photo 3-112), and Big Sand basaltic lava flows and cinder cones that cover large areas in the central part of the NCA have been dated from 1.1-1.5 million years old. These basaltic rocks erupted from cones and vents approximately 5-12 miles north of St. George around Snow Canyon, and flowed down toward and into Middleton. The 0.9 million year old Washington flow moved down Grapevine Wash in the NCA. The East Reef Cinder Cone and lava flow is about 300,000 years old and the Radio Tower Cone and lava flow on the east end of the NCA is about 60,000 years old (Biek et al. 2009).

3.25.3.10 Surficial Deposits

Quaternary age alluvial, colluvial, talus, and aeolian surficial deposits cover approximately 17% of the NCA (Photo 3-113).

"Children have a great urge to learn about dinosaurs."

Jack Horner, Paleontologist, 1946–

3.25.4 Paleontological Resources

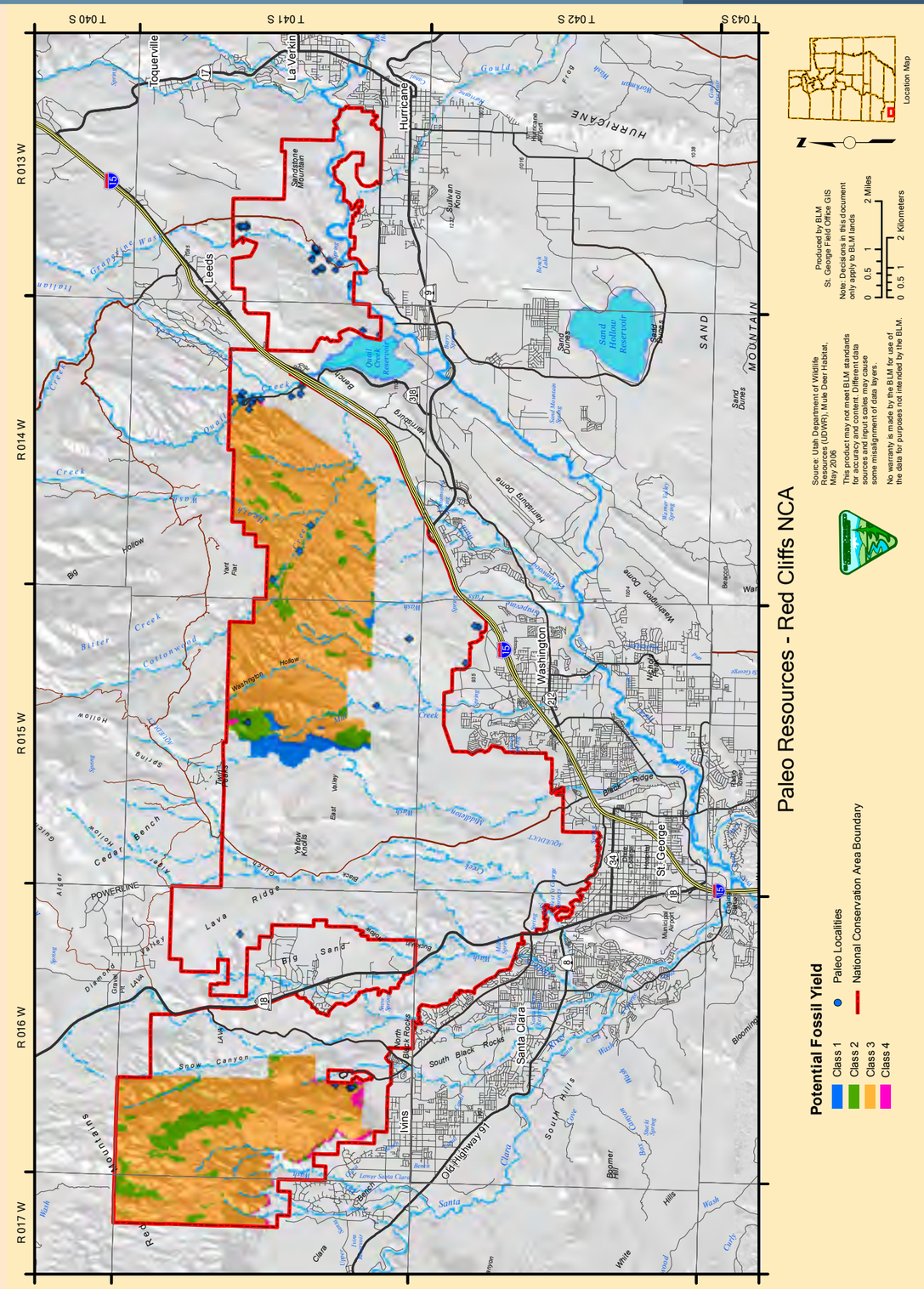
Paleontological resources are managed by BLM for their scientific, educational, and recreational values. By law, only paleontologists and other scientists who are working under permits issued by BLM may collect or excavate vertebrate fossils, trackways, and noteworthy occurrences of fossilized invertebrates or plants (refer to Appendix C for a listing of the federal laws that apply).

BLM uses a potential fossil yield classification system to rate the potential of geologic units to contain significant fossil resources. This classification system predicts that fossils might be found in particular formations on the basis of past scientific experience. Five classes were developed for this system, with Class I having very low potential for containing significant fossils and Class V having very high potential. In 2010, paleontologists from the Utah Geological Survey prepared a PFYC evaluation for the Cottonwood Canyon and Red Mountain Wilderness areas and conducted target field surveys in areas with the highest potential for containing significant fossils in the wilderness and elsewhere in the NCA (DeBlieux et al. 2011). Map 3-32 displays the PFYC classifications for the two wilderness areas. Table 3-32 identifies the geologic formations of the NCA, their predominant lithologies, and the types of fossils known to occur in the formation.

To date, inventories conducted in NCA have identified 46 scientifically significant paleontological localities. A majority of the localities are dinosaur tracks and trackways, including swim tracks with claw marks, fossilized skeletal remains, and coprolites. These localities are in the Triassic Chinle Formation, Triassic-Jurassic Moenave Formation, and the

Table 3-32 Paleontological Resources by Geologic Formation

Age	Formation/Unit Name	Lithology	Fossils Present
Quaternary	Surficial deposits, includes pediment, alluvial, colluvial, eolian, and lacustrine	Gravel/sand/clay	Vertebrates, possible fossilized packrat middens
	Volcanic flows and associated deposits	Basalt, andesite	None reported
Cretaceous	Iron Springs Formation	Sandstone, siltstone, mudstone	Vertebrate, Invertebrate, Plants
Jurassic	Carmel Formation	Sandstone, siltstone, limestone, gypsiferous siltstone	Invertebrate, Vertebrates
	Temple Cap Sandstone	Sandstone, siltstone, mudstone, gypsum	None reported
	Navajo Sandstone	Sandstone	Vertebrates
	Kayenta Formation (includes Springdale Sandstone Member at the base)	Siltstone, sandstone, mudstone, rare dolomite unit by Gunlock	Vertebrate, Invertebrates
Triassic-Jurassic	Moenave Formation (includes Whitmore Point and Dinosaur Canyon Members)	Mudstone, siltstone, sandstone	Vertebrate, Invertebrate, Plants
Triassic	Chinle Formation (includes Petrified Forest and Shinarump Members)	Sandstone, siltstone, mudstone	Vertebrates, Invertebrates, Plants
	Moenkopi Formation	Sandstone, siltstone, mudstone, gypsum, conglomerate at base	Vertebrates, Invertebrate, Plants



Jurassic Kayenta Formation, all of which are considered to be high potential for scientifically significant paleontological resources. Localities with fossilized plant remains have also been identified. There is a potential for the Quaternary and Tertiary Formations to include vertebrate fossils in cave/alcoves and unconsolidated fill.

Vertebrate trace fossils (dinosaur tracks) have been found in the Jurassic-age Navajo, Kayenta, and Moenave Formations in the NCA (Photo 3-114). Particularly well-preserved and numerous dinosaur tracks have been identified in the Babylon/East Reef area.

Fossilized bones have been reported from the Chinle Formation, Moenave Formation, and Springdale Member of the Kayenta Formation. Bones from phytosaurs (long-snouted crocodile-like reptiles) and metoposaurs (large crocodile-like amphibians) have been found in the Chinle Formation. Bones and scales from fossil freshwater fish fauna, including shark, lungfish, and coelacanth, have been identified from the Whitmore Point Member of the Moenave Formation.

Silicified or "petrified" wood is found in many areas of the NCA. Although some petrified wood has been found in the Triassic Moenkopi Formation, the Springdale Member of the Kayenta Formation, and the Cretaceous Iron Springs Formation, the greatest concentration of the petrified wood is present in the Triassic Chinle Formation.

3.26 CAVE AND KARST RESOURCES

The reader is referred to the Affected Environment for the Beaver Dam Wash NCA for definitions of caves and karsts and an overview of BLM management of these geological features.

No comprehensive inventories have yet been conducted to identify caves, karsts, rock shelters, alcoves, and lava tubes in the NCA. To date, a single cave has been documented, as well as a number of rock shelters and alcoves in the massive outcrops of Navajo Sandstone. Some of the shelters contain archaeological materials, rock art, and other evidence of past human occupations (Photo 115). In various areas in the NCA, there are Pleistocene age basalt flows that are likely to contain lava tube remnants. Such tubes often contain archaeological materials and may support diverse fauna.

"Dinosaurs may be extinct from the face of the planet, but they are alive and well in our imaginations."
–Steve Miller, Author

Photo 3-114 Dinosaur Tracks in Kayenta Formation

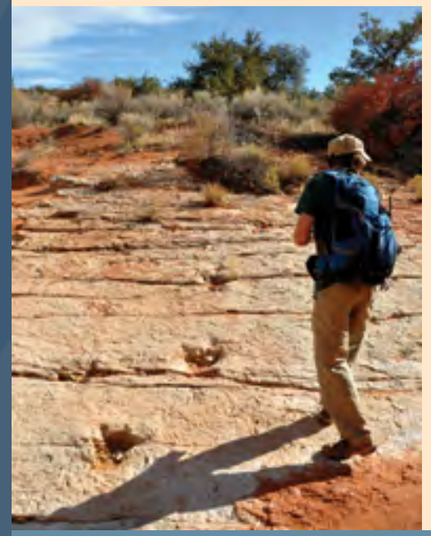


Photo 3-115 Tool Marks on Navajo Sandstone in Rock Shelter

3.27 SOIL RESOURCES

The reader is referred to the Affected Environment for the Beaver Dam Wash NCA for information about how soils are grouped and evaluated for their physical properties and productivity potential. That section also includes the Standard for Soils, developed as part of the Utah Standards and Guides (Appendix D) that BLM applies to the evaluation of soil conditions and the development of land use and implementation-level management decisions.

The following provides a brief summary of the soil setting and major soil types that were identified for the Red Cliffs NCA, through a soil survey conducted between 1967 and 1971, by the USDA, Soil Conservation Service, BLM, and NPS (Mortensen et al. 1977). Clearly, some vegetation communities, soil conditions, and land uses have changed noticeably since that survey was conducted more than 50 years ago; however, the data represents the best available information on soil resources of the NCA.

3.27.1 Soil Setting

Soil types of the NCA are varied but many share common features, such as shallow to moderate depth, low surface organic matter, and low water holding capacity. Soils in drainages tend to have somewhat sandier surface textures, are somewhat deeper, and may be more saline in chemical composition. Nearly two thirds of the NCA is comprised of miscellaneous land forms, such as "rock land," "cinderlands," and "stony colluvial lands." Approximately 300 acres were mapped as "eroded or gullied lands," meaning that at the time of the survey in the early 1970s, soil scientists noted excessive gully formation and losses in soil productivity due to large scale down-cutting and erosional events.

3.27.2 Soil Types

Map 3-33 displays the different soil types that were mapped in the NCA; the following sections summarize the characteristics of each type, as described by Mortensen et al. 1977.

The Rock Outcrop soil type consists of exposures of bare bedrock (mostly sandstone, limestone, or basalt) and occurs extensively throughout the NCA (Photo 3-116). Slopes are variable, ranging from sloping to very steep or nearly vertical. Rock Outcrop generally has no vegetation, but in some places stunted pinyon pine may grow in crevices or pockets of soil material.

"A true scientist never loses the faculty of amazement. It is the essence of his being."
–Hans Selye, Endocrinologist, 1907-1982

Photo 3-116 Rock Outcrop, Cottonwood Canyon Wilderness, Red Cliffs NCA

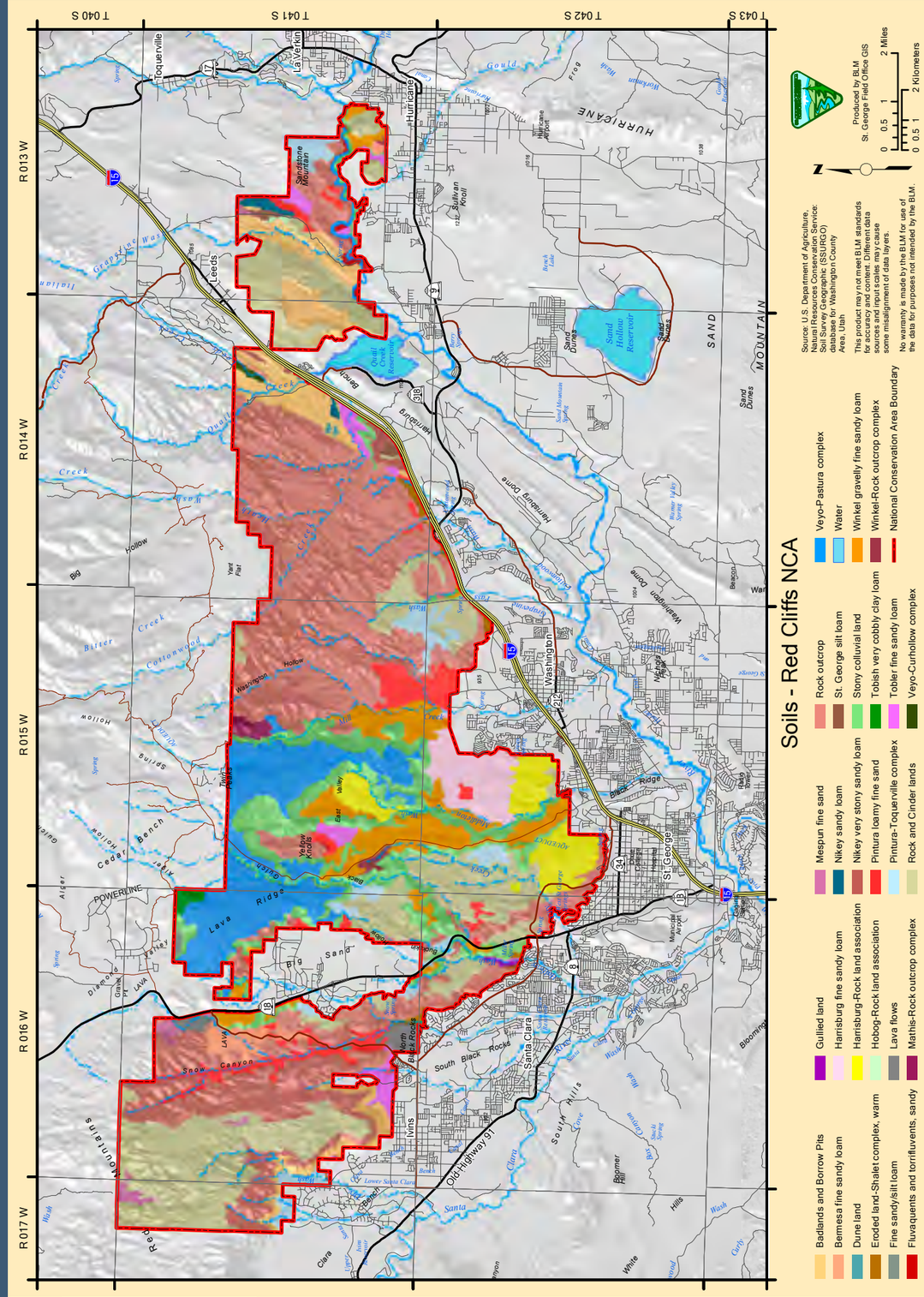


Photo 3-117 Rock Land, Red Mountain Wilderness, Red Cliffs NCA

Rock Land consists of 60-80% rock outcrops and 20-40% soils that are very shallow over bedrock. Slopes are gently sloping to steep. Some areas of soil accumulation support shrubs and forbs at lower elevations and pinyon pine and juniper at mid and higher elevations (Photo 3-117).

Veyo-Pastura complex soil is about 50% cobbly sandy loam, 40% gravelly loam and 10% other soils (Photo 3-118). Runoff potential is moderate and the hazard of erosion is slight. Stony colluvial land consists of unconsolidated stones and rock fragments that accumulate on slopes and at the base of slopes. Some areas of shallow soils may exist, although slopes are generally steep to very steep (30-70%). Erosion is considered moderate and sediment production is low to medium, depending on vegetation cover.

Badlands consists of nearly barren, multicolored beds of eroding shale, shale interbedded with sandstone, and shale inter-bedded with layers of gypsum. The landscape is rolling and severely dissected with branching intermittent streams. Runoff is very rapid. The sediment potential is high during intense thunderstorms in summer. Badlands support sparse vegetation.

Photo 3-118 Veyo-Pastura Complex, Lava Ridge, Red Cliffs NCA

"Rocks do not recommend the land to the tiller of the soil, but they recommend it to those who reap a harvest of another sort—the artist, the poet, the walker, the student, the lover of all primitive open-air things."

–John Burroughs, Naturalist and Poet, 1837–1921

"It isn't the mountains ahead to climb that wear you out; it's the pebble in your shoe."
–Muhammad Ali, Former Professional Boxer, 1942–

Photo 3-119 Winkel Gravelly Fine Sandy Loam, Black Knolls, Red Cliffs NCA

Winkel gravelly fine sandy loam soil occurs on basalt mesa tops located in the central portion of the NCA (Photo 3-119). Runoff is slow, and the hazard of erosion is moderate.

Harrisburg fine sandy loam, a nearly level to sloping soil, is found on mesas in the NCA. Runoff is slow, and the hazard for erosion is slight.

Harrisburg-Rock Land soil consists of interspersed areas of bare rock and rock that has a thin covering of fine sand (Photo 3-120). Runoff is medium and the hazard of erosion is moderate.

Pintura-Toquerville complex soil forms on ridges and slopes (Photo 3-121). The Pintura loamy fine sand soil occurs on the leeward side of ridges and the lower parts of slopes, where wind tends to deposit drifting sand. The Toquerville soil is on the windward side of ridges, ridge tops, and blow-out areas. Runoff is very slow, and the hazard of erosion is moderate to severe.

Photo 3-120 Harrisburg-Rock Land, East Valley, Red Cliffs NCA

Photo 3-121 Pintura-Toquerville Complex, Twist Hollow, Red Cliffs NCA

Photo 3-122 Fluvaquents and Torrifluvents, Virgin River, Red Cliffs NCA

Fluvaquents and torrifluvents are sandy soils of the Virgin River flood plain (Photo 3-122). Fluvaquents are deep, somewhat poorly drained and poorly drained soils that formed in sandy alluvial deposits derived from sandstone, limestone, and shale. During periods of high runoff, many areas of fluvaquents are flooded for short periods of time. Runoff is slow, and the hazard of erosion is severe. Torrifluvents are deep, well drained and moderately well drained soils that formed in alluvial deposits derived from sandstone, limestone, and shale. Permeability is rapid, making runoff slow, although the hazard of erosion is moderate to severe.

Burmesa soils are associated with basalt flow areas, but may be overlain by sandstone or shale. There is a carbonate hardpan that is root restrictive above the bedrock contact. They may have as much as 20% Rock Land and 10% other soil inclusions. Runoff is slow and erosion hazard is moderate.

The Eroded Land Shalet complex is a map unit of small extent, but is described here due to its importance as a sediment source. The complex is comprised of stratified shale and gypsum-rich soil that are found in swales and slopes. Erosion is active and sediment production is high from soils in this complex.

3.27.3 Sensitive and Fragile Soils

Some of the soil types of the NCA have several intrinsic properties that make them "sensitive" or "fragile," meaning that they are very susceptible to erosion. These properties may include high salt concentrations, fine or coarse textures, shallow depths, or locations on steep slopes. Many soil types support very sparse vegetative cover; soil particles are not held in place by plant roots, thereby increasing the potential for erosion by wind and water.

The Moenkopi and Kayenta Formations contain gypsiferous beds that contribute to the salinity of specific soil types, like the Eroded Land Shalet complex described above. Soil erosion is one mechanism through which salinity levels of the Virgin River are increased, ultimately contributing to high salinity levels in the Colorado River. Salinity in surface runoff can be closely linked to the loss of vegetation cover. Thus, effective vegetation management and minimization of soil erosion can help to reduce runoff that contributes to the salinity and TDS levels of the Virgin River.

"Some of the soil types of the NCA have several intrinsic properties that make them "sensitive" or "fragile," meaning that they are very susceptible to erosion."

"In nature we never see anything isolated, but everything in connection with something else which is before it, beside it, under it and over it."
–Johann Wolfgang von Goethe, Poet, Zoologist, Botanist, Geologist, 1749–1832

3.27.3.1 Biological Soil Crusts

The reader is referred to the description of biological soil crusts and their ecological functions provided in the Affected Environment for the Beaver Dam Wash NCA. Soil crusts have not been mapped in the Red Cliffs NCA, so data on their areal extent or condition are not currently available.

3.28 NATIVE VEGETATION COMMUNITIES

3.28.1 Ecozones

The Red Cliffs NCA is located at the convergence of three ecoregions—the Mojave Desert, Great Basin, and Colorado Plateau—placing it within an ecologically-rich and diverse transition zone that is generally similar to that of the Beaver Dam Wash NCA. The reader is referred to the Affected Environment of the Beaver Dam Wash NCA for a description of the Mojave Desert ecozone and Mojave-Great Basin transition zone. While these same ecozones also overlap in the Red Cliffs NCA, there are subtle differences in the species that are found within them, illustrating the effects of species interactions and evolutionary changes that occur in transition zones, sometimes called "edge effect." As one example, Joshua trees do not grow in the blackbrush community of the Red Cliffs NCA.

Red Cliffs NCA also exhibits many characteristics of the semi-arid benchlands and canyons that typify the Colorado Plateau ecoregion, including sandstone formations, sandy soils, slightly higher levels of precipitation, and slightly cooler temperatures. The influences of the Colorado Plateau allow native vegetation communities, like the desert sand sagebrush (*Artemisia filifolia*), to grow in Red Cliffs NCA, but not in Beaver Dam Wash NCA. The following briefly describes the native vegetation communities of the Red Cliffs NCA, with data primarily derived from Provencher et al. (2011).

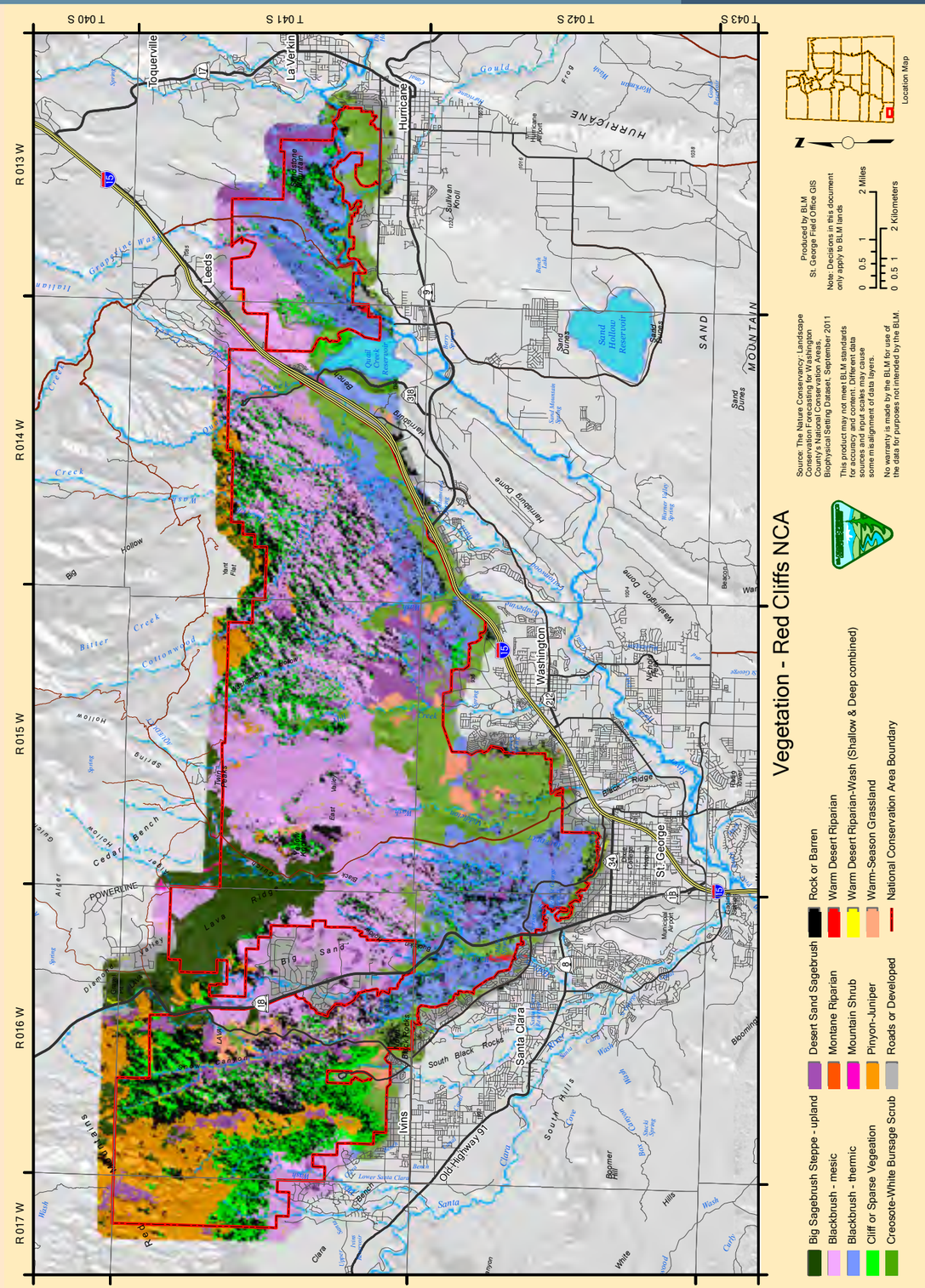
3.28.2 NCA Vegetation Communities

In 2011, a similar Landscape Conservation Forecasting process was completed for the Red Cliffs NCA, using the methodologies described in the Affected Environment for Beaver Dam Wash NCA. This process identified 11 vegetation communities in the NCA, as shown in Table 3-33. Map 3-34 shows the distribution of each vegetation community; Map 3-35 displays the percent cover of exotic annuals within the NCA. The following is a brief summary description of the species composition for each of the 11 vegetation communities identified in the NCA.

Table 3-33 Vegetation Communities

Vegetation Community	Acres	Percentage of NCA Landbase
Big Sagebrush Steppe-Upland	3,061	8.90
Blackbrush-Mesic	17,260	50.18
Blackbrush-Thermic	5,005	14.55
Creosotebush-White Bursage Scrub	3,043	8.85
Desert Sand Sagebrush	1,586	4.61
Montane Riparian	40	0.12
Mountain Shrub	4.2	0.012
Pinyon-Juniper	3,719	10.81
Warm Desert Riparian	160	4.57
Warm Desert Riparian-Wash	402	1.17
Warm-Season Grassland	118	0.34
Total	34,398.9	100

Source: Provencher et al., 2011.



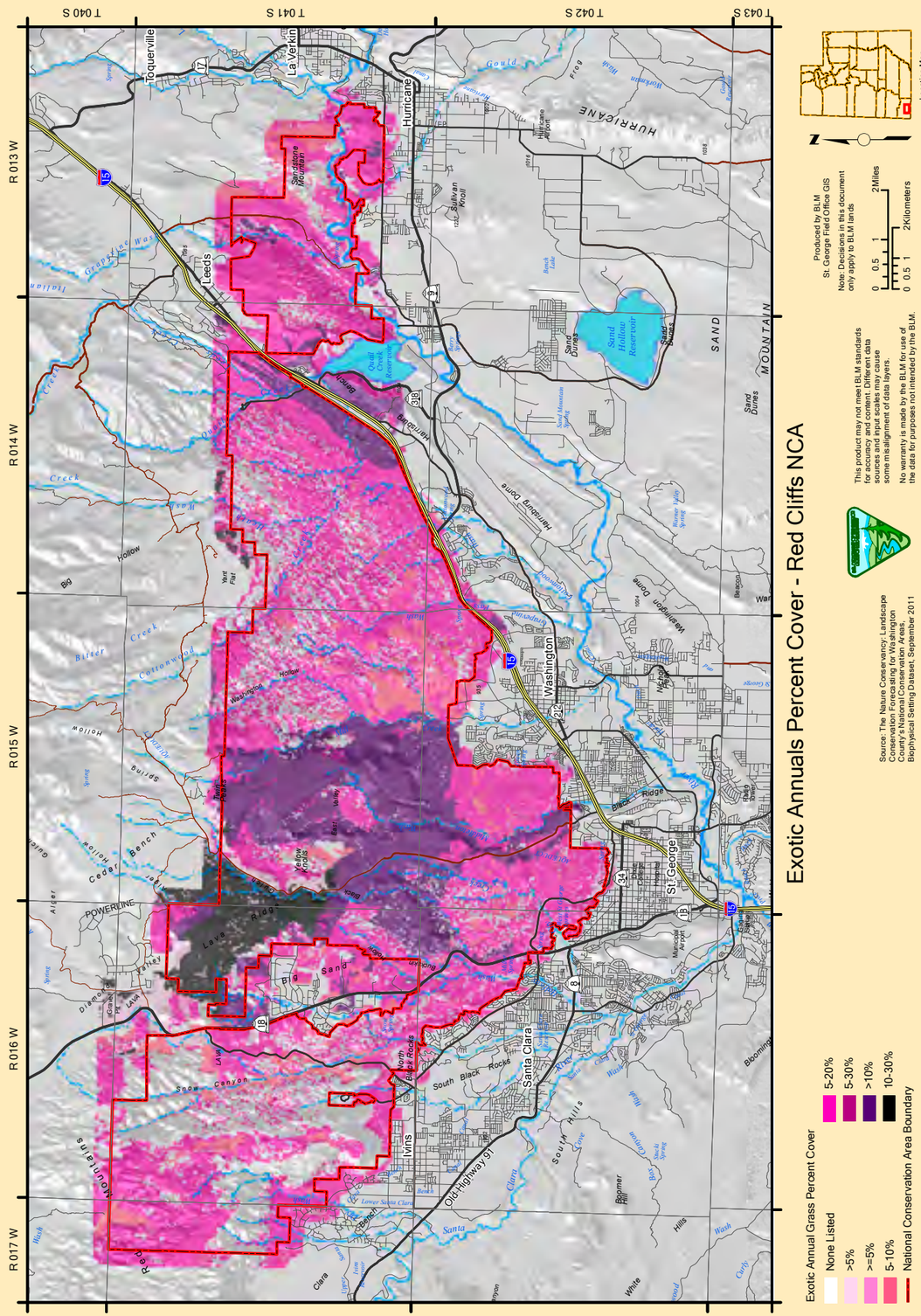


Photo 3-123 Big Sagebrush Steppe Community

Big Sagebrush Steppe (Photo 3-123) covers approximately 3,061 acres in the NCA. The community is usually dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Grasses are abundant and often diverse. Community species composition has at least 10-30% invasive annual grass species (Provencher, et al. 2011).

The Blackbrush community of the NCA is comprised of two variants, mesic and thermic, in which there are small differences in species composition. Joshua trees are absent from both variants of this community in the Red Cliffs NCA.

The majority (17,269 acres) of the NCA is covered by a Mesic Blackbrush community (Photo 3-124)found in transition zones between the Mojave Desert and Colorado Plateau ecoregions, The dominant shrubs are blackbrush, buckwheat (*Eriogonum* spp.), Mormon tea, spiny hopsage, and banana yucca. Utah juniper is often associated with mesic blackbrush at higher elevations. Between 5-20% of this community has been invaded by invasive annual brome grasses.

Approximately 5,005 acres are covered by Thermic Blackbrush community

Photo 3-124 Mesic Blackbrush Community

"Let the gentle bush dig its root deep and spread upward to split the boulder."
–Carl Sandburg, Poet, 1878–1967

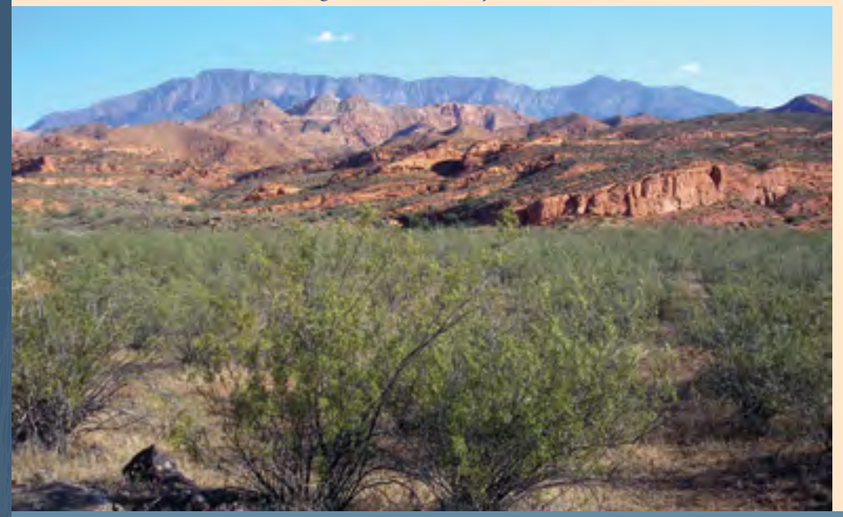
Photo 3-125 Thermic Blackbrush Community

(Photo 3-125). With the exception of Utah juniper, all the species present in Mesic Blackbrush communities (listed above) are also present in the thermic variant, as is white bursage. This variant occurs at lower elevations of the NCA, where summer temperatures are higher and annual precipitation is less than 10 inches per year. Due to the prevalence of invasive annual brome grasses, this community has high dissimilarity from its NRV.

The lowest elevations of the NCA support approximately 3,043 acres of the Creosote-White Bursage Scrub community (Photo 3-126), typically found below the blackbrush zone on well-drained alluvial fans. Creosote bush and white bursage dominate, with bursage more prevalent on warmer and drier sites. None of the NRV values are being met for this community because of the prevalence of invasive annual brome grasses.

Approximately 1,586 acres of Desert Sand Sagebrush (Photo 3-127) occur in Red Cliffs NCA; this is a community that is not found in the Beaver Dam Wash NCA. The dominant and diagnostic species is

Photo 3-126 Creosote-White Bursage Scrub Community



"None of the NRV values are being met for the Creosote-White Bursage Scrub community because of the prevalence of invasive annual brome grasses."

Photo 3-127 Desert Sand Sagebrush Community

sand sagebrush, which grows in deep sandy soils. Subdominant shrubs include snakeweed (*Gutierrezia* spp.) and desert almond, as well as common grasses like big galleta, Indian ricegrass, and desert needlegrass. Invasive annual brome grasses also are prevalent in this community.

Approximately 40 acres of Montane Riparian Community were mapped in steep-sided canyons along the northern boundary of the NCA. These canyons are subject to temporary flooding during spring runoff and the underlying gravels maintain the shallow water needed to support the Fremont's cottonwood, willows, buffaloberry (*Shepherdia* spp.), and velvet ash (*Fraxinus velutina*) of this community.

By far the smallest community in the NCA, the Mountain Shrub Community is found on only 4.2 acres. Stansbury cliffrose is the diagnostic shrub of this community. Between 10%-30 % of the vegetation of this small community is comprised of invasive annual brome grasses.

The Pinyon-Juniper Woodland (Photo 3-128), totaling approximately 3,719 acres, is found primarily in the two

Photo 3-128 Pinyon-Juniper Woodland Community

"The wind blows sand in my teeth but also brings the scent of flowering cliffrose and a hint of mountain snow, more than adequate compensation."
–Edward Abbey, Author, 1927-1989

"A cold wind was blowing from the north, and it made the trees rustle like living things."
–George R. R. Martin, Author, *Game of Thrones*, 1948–

designated wilderness areas (Red Mountain Wilderness and Cottonwood Canyon Wilderness) in the NCA. This woodland is dominated by a mix of pinyon pine and Utah juniper, with a diverse understory of shrub and grass species. Between 5-30% of this community has been invaded by exotic annual brome grasses; these are very prevalent in areas that have been damaged by recent wildfires.

Approximately 160 acres of Warm Desert Riparian community (Photo 3-129) are found along perennial streams/rivers in the NCA and includes willows, Fremont's cottonwood, mesquite, and various rushes, sedges (*Cyperaceae* spp.), and cattails. Non-native species in this community include tamarisk and invasive annual brome grasses. Approximately 402 acres of this community are within deeply-incised ephemeral drainages. Flash-flooding is the major disturbance in this community. Gravels and desert shrub species dominate, with shrub cover increasing over time between flood events.

Warm Season Grasslands cover approximately 118 acres of the Red Cliffs NCA, but are not found in the Beaver Dam Wash NCA. Galleta grass is the dominant species and usually abundant, although Indian ricegrass may be present. These native grasses grow on fine grained, often sandy soils, on gentle to moderate slopes.

3.29 FIRE AND FUELS MANAGEMENT

The reader is referred to this section in the Affected Environment for Beaver Dam Wash NCA for information about the natural fire regime of the Mojave Desert ecozone and Mojave-Great Basin transition zone, and how FRCCs are defined and used by BLM in fire and fuels management.

3.29.1 Fire Regime Condition Class

Warmer annual temperatures, prolonged droughts punctuated by years of above-average fall-winter precipitation, and the proliferation of invasive annual grasses are fueling an annual burn-reburn wildfire cycle in the Red Cliffs NCA. Mojave Desert species are not adapted to frequent and large-scale wildfires and do not recover quickly or successfully from the effects of fires. Conversions of native communities from desert shrublands to invasive grasslands have already occurred in areas of the NCA. Some of these areas have burned repeatedly—two, three, or even four times during the past 20 years. Those areas have very little woody vegetation remaining and are largely vegetated with brome grasses and non-native filaree.

Photo 3-129 Warm Desert Riparian Community

In 2004, approximately 22,483 acres of the NCA were classified as FRCC 2; 37,976 acres were listed as FRCC 3; and 747 acres were identified as FRCC 9 (un-vegetated areas, such as slick rock or dune fields). Like Beaver Dam Wash NCA, the FRCC estimates for Red Cliffs NCA became rapidly outdated as a result of the catastrophic fires in 2005 and 2006 and the prevalence of invasive annual grasses. All vegetated areas are now ranked as "highly departed" from the NRV for the specific on-site vegetation types, due to the presence of invasive annual grasses. It is likely that if the FRCC assessments were repeated today, many areas within the NCA that were previously classified as FRCC 2 would be documented as having converted to FRCC 3. Fire frequencies have departed from historic frequencies by multiple return intervals, vegetation attributes have been significantly altered from the historical range, and the risk of losing key ecosystem components is high.

3.29.2 Fire Occurrence

Map 3-36 displays fire occurrence over a 20 year period in the NCA, while Map 3-37 depicts a cumulative fire history and shows areas that burned more than once between 1993 and 2013.

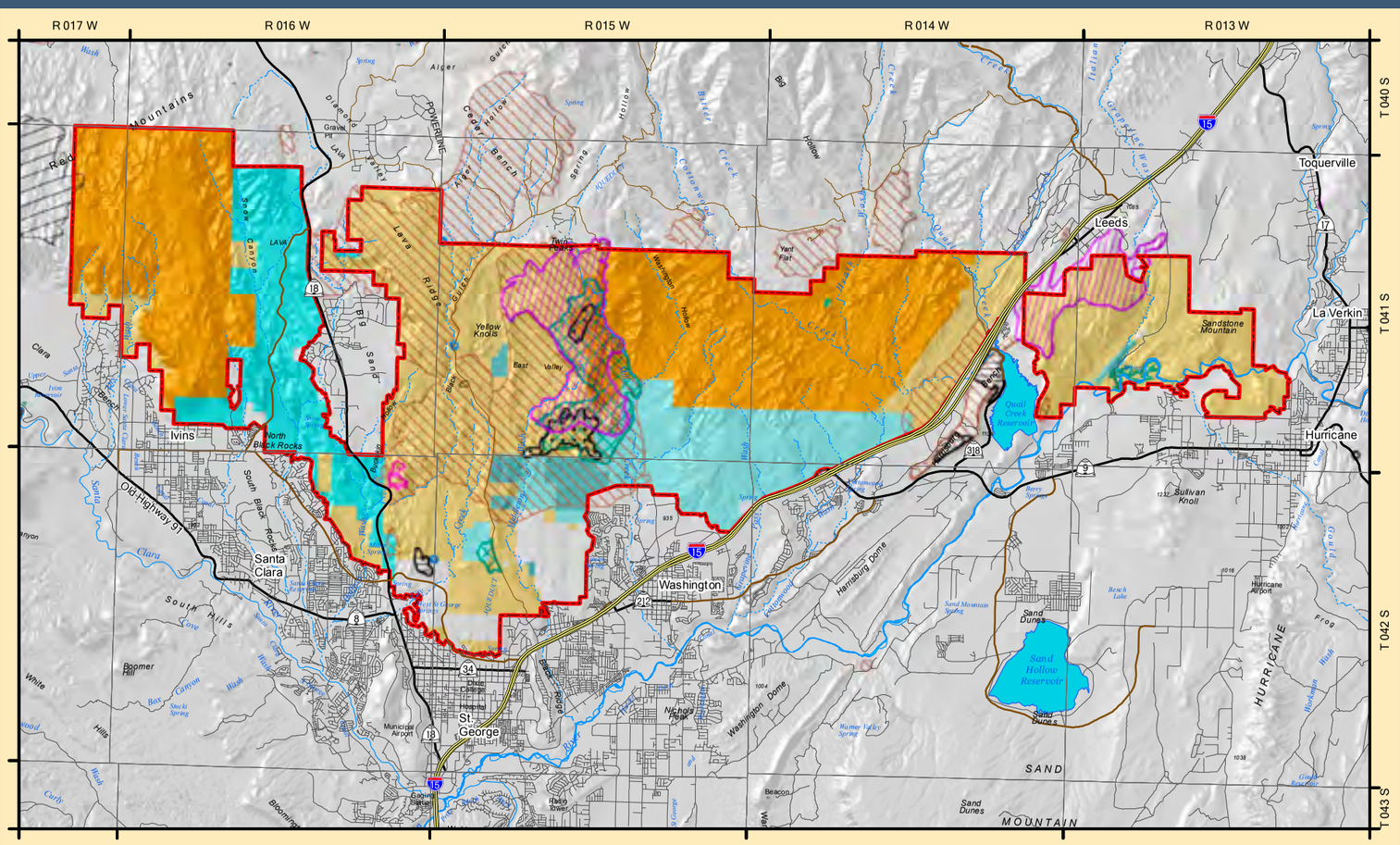
Between 1976 and 1993, five small wildfires were recorded within today's NCA. The largest of these fires occurred in 1989 and burned a total of 70 acres; the remaining four fires were less than 0.5 acre each in size. From 1993 onward, while there were years with no fires reported, when wildfires did occur they were larger and impacted more acres than in the past. In 1993, for example, four fires damaged a total of 2,085 acres of public land in the NCA; in 1998, two fires damaged 494 acres of public land.

The fire seasons of 2005 and 2006 were indicative of what has become the "new" fire regime in the Mojave Desert ecozone and Mojave-Great Basin transition zone, demonstrating the "cause and effect" relationship between above-average fall-winter precipitation that triggers increased production of invasive annual brome grasses, and uncharacteristically large wildfires during the summer months. During these two years, 11 fires burned in the NCA and consumed 12,390 acres of BLM-managed public land (acres that were re-burned by multiple fires are not double-counted in this total).

More recently, 2012 proved to be another severe fire season, with two large fires burning a total of 4,136 acres within the NCA. The smaller of the two fires (the

Photo 3-130 Quail Fire of 2012 in Previously Unburned Landscape

"The most tangible of all visible mysteries—fire."
–Leigh Hunt, Essayist, 1784–1859



Wildland Fire History 1992-2014 - Red Cliffs NCA

- Wildland Fires - 1993
- Wildland Fires - 1994
- Wildland Fires - 1998
- Wildland Fires - 1999
- Wildland Fires - 2005
- Wildland Fires - 2006
- Wildland Fires - 2008
- Wildland Fires - 2011
- Wildland Fires - 2012
- National Conservation Area Boundary
- BLM Wilderness Area
- Bureau of Land Management
- State
- State Parks and Recreation
- State Wildlife Reserve
- US Forest Service
- USFS Wilderness Area

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0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

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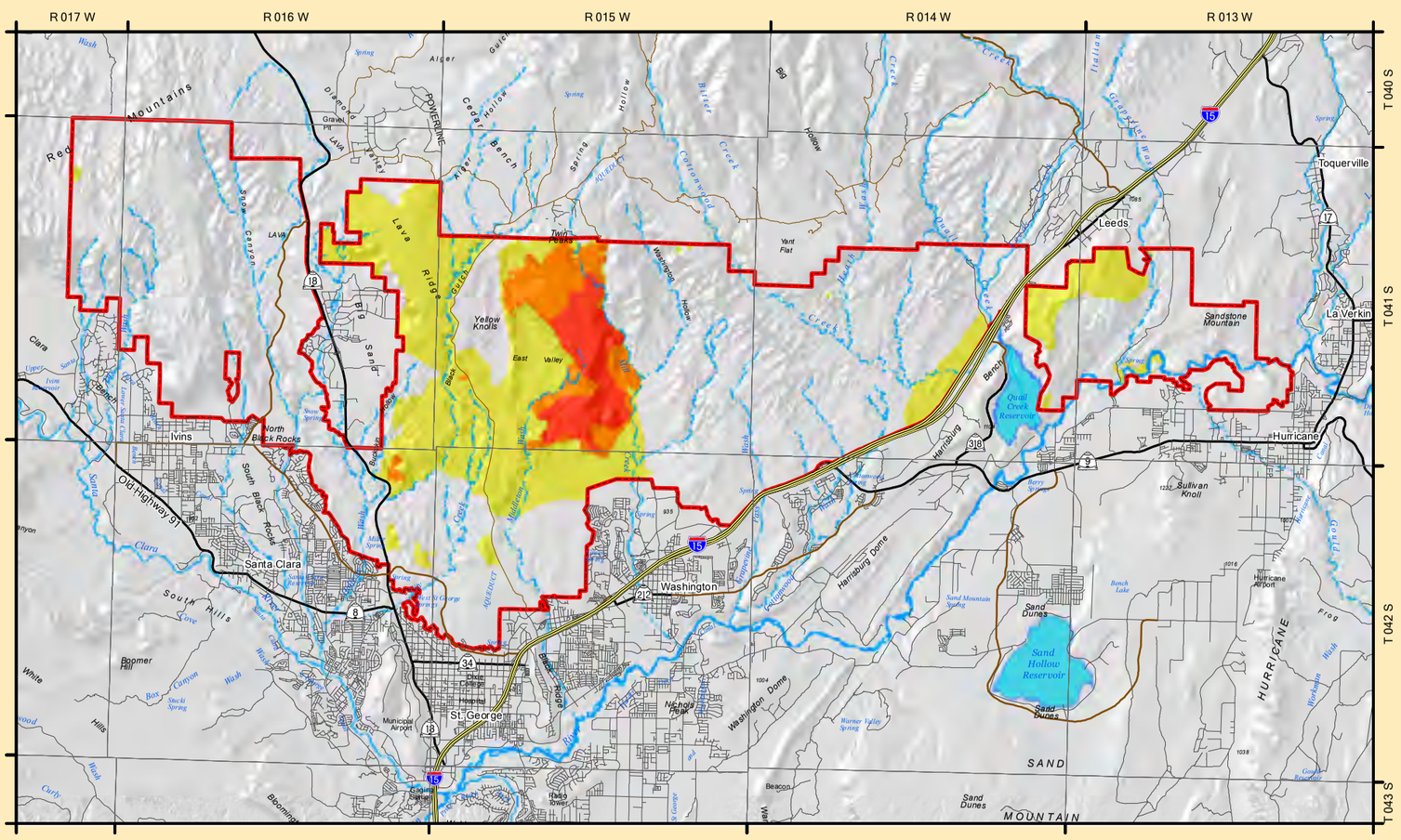
Location Map



Cumulative Fire History - Red Cliffs NCA

Number Times Burned 1993-2013

- 1
- 2
- 3+
- National Conservation Area Boundary

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N

Location Map

"In the springs of 2011, 2012, and 2013, herds of goats were contracted to graze along the fenced shoulders of Cottonwood Road, in conjunction with labor crews using string trimmers to cut brome grasses and other non-native vegetation."

Quail Fire) was in a previously unburned area in Babylon (Photo 3-130). The larger fire (the Reserve Fire) re-burned areas that had burned in 2005, some of which had also burned in 1993 and 1998. In total, 13,506 acres of BLM-managed public lands have burned within the NCA since 2000 (acres that burned multiple times are not double-counted in this total).

Hazardous fuels management projects have only recently been initiated in the NCA and have been limited to experimental biological, hand tool, and herbicidal treatments along a single major roadway, in an effort to explore cost-effective fuel treatments while minimizing surface disturbances and other impacts on desert tortoise populations and designated critical habitat. In the springs of 2011, 2012, and 2013, herds of goats (Photo 3-131) were contracted to graze along the fenced shoulders of Cottonwood Road, in conjunction with labor crews using string trimmers to cut brome grasses and other non-native vegetation along the same roadway. In the fall of 2013, BLM treated road shoulders along Cottonwood Road with imazapic, a pre-emergent herbicide, to prevent the growth of invasive brome species the following spring. The cost-benefits of the various treatment methods are currently being evaluated to determine which would be most effective for use along other roadways and other areas within the NCA.

3.29.3 Wildland Fire Suppression

Red Cliffs NCA is divided between the Great Basin and Mojave Desert Fire Management Units (FMUs) (BLM 2004). Most of the area is critical habitat for desert tortoise, and both the Red Mountain and Cottonwood Canyon Wilderness areas are located within the boundaries of the NCA. There are Wildland Urban Interface (WUI) areas, comprised of residential subdivisions and light commercial business complexes, along the entire southern edge of the NCA. Portions of the eastern, southern, and western NCA are within the annexation boundaries of the cities of Ivins, Santa Clara, St. George, Washington, Hurricane, Leeds/Silver Reef, and LaVerkin. Additional WUI areas occur along the northwestern and northeastern boundaries of the NCA, where rural residential subdivisions like Winchester Hills, Diamond Valley, Hidden Valley, and Broken Mesa abut the NCA. The electrical substations within the NCA are also considered WUI areas (BLM 2004).

Photo 3-131 Goat Herd on Cottonwood Road during Hazardous Fuels Reduction Project

"Three species of noxious weeds—Scotch thistle, tamarisk, and giant reed—are found in Red Cliffs NCA."

Currently, all fires within the NCA are targeted for full suppression. This is due to the goals for these FMUs, the MOG recommendations for fire fighting within desert tortoise habitat, the FRCC of 3, and the extensive WUI areas that surround the NCA. Fires within the two designated Wilderness areas may be fought using minimum impact supression techniques (MIST), if the fires do not threaten critical resources, infrastructure, human health and safety, or other pre-designated criteria. Map 3-38 displays the current fire management response for the NCA.

3.30 NOXIOUS WEEDS AND INVASIVE SPECIES

The reader is referred to the Affected Environment for Beaver Dam Wash NCA for a discussion of how the State of Utah characterizes noxious weeds and identifies containment priorities by species.

Three species of noxious weeds—Scotch thistle, tamarisk (or saltcedar), and giant reed (*Arundo donax*)—are found in Red Cliffs NCA. A systematic inventory of the entire land base of the NCA has not been conducted, so complete data on the extent of all infestations are currently unavailable.

Approximately 5 acres of Scotch thistle infestation has been identified and are being actively treated by BLM to prevent its spread. Tamarisk is present along Leeds and Quail Creeks, the Virgin River, and in some ephemeral washes of the NCA. Giant reed has invaded the riparian zone along the Virgin River in the NCA and treatments were conducted to control this weed in 2014.

3.31 VEGETATION RESOURCE USES: LIVESTOCK GRAZING

The reader is referred to the Affected Environment for Beaver Dam Wash NCA for a brief history of livestock grazing in Washington County and those factors, such as the 1990 USFWS listing of the Mojave desert tortoise as a threatened species under the ESA, that have influenced the management of grazing on BLM-managed public lands in the two NCAs.

3.31.1 NCA Grazing Allotments

A majority of the land base of the NCA has been unavailable to livestock grazing since 1999, through decisions from the 1999 SGFO RMP. Federal permits for livestock grazing on seven allotments in the NCA were voluntarily relinquished by the permit holders, who were compensated for the value of the permits by Washington County.

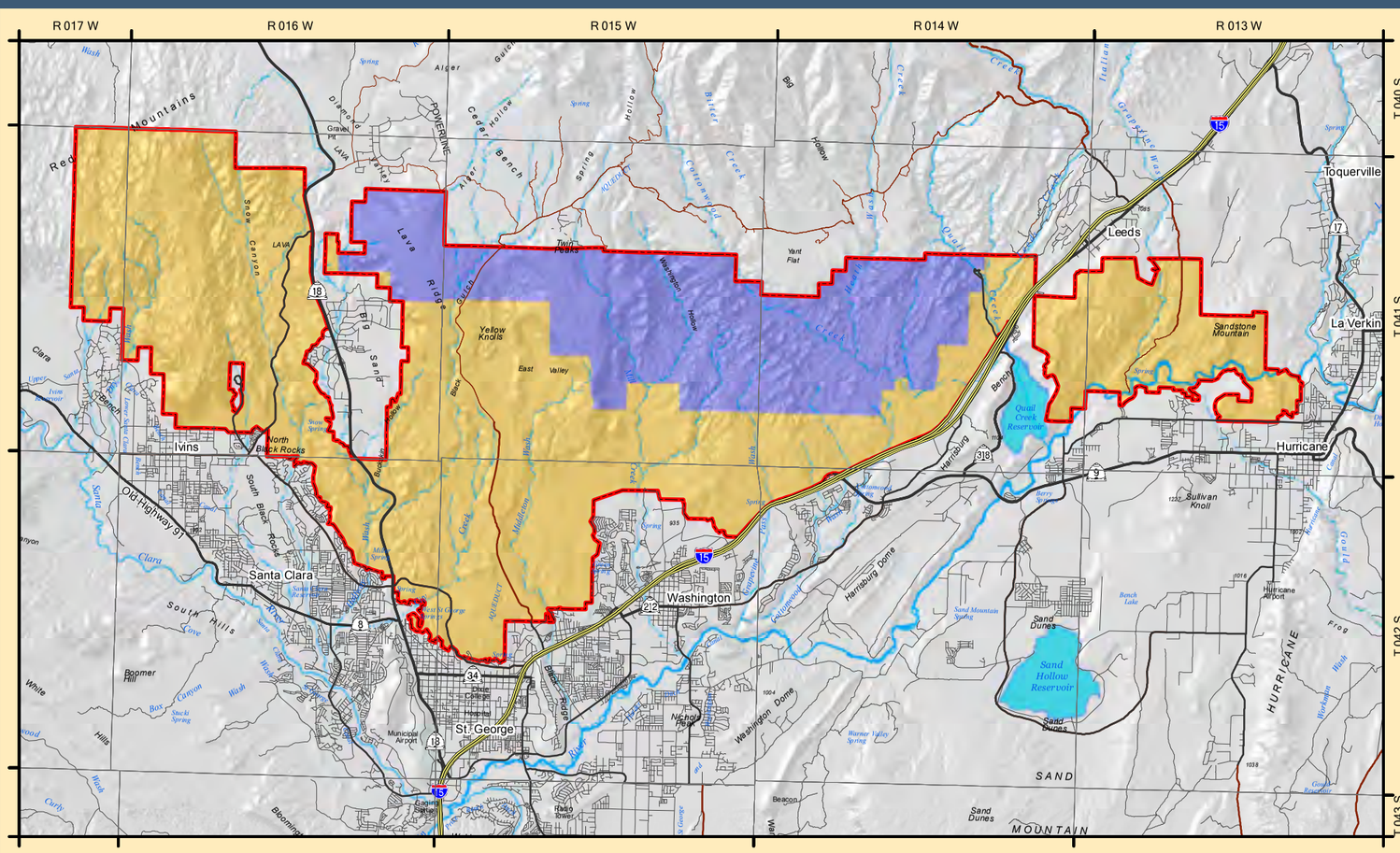
Portions of the Veyo, Sand Wash, and Diamond Valley allotments are located within the boundaries of the Red Cliffs NCA and these allotments continue to be available for livestock grazing. Table 3-34 provides data on permitted grazing use for the entire allotment, while Map 3-39 displays the locations of the three allotments. Grazing use in the allotments is described below.

3.31.1.1 Veyo Allotment

The Veyo allotment is comprised of approximately 18,900 acres, of which only 1,100 acres are within the NCA in the Red Mountain Wilderness. The terrain is generally not well suited to livestock

Table 3-34 Permitted Livestock Grazing Use

Allotment Name	Number Of Cattle	Season Of Use	Active Federal AUMs	Percent Public Land
Veyo	108	10/16 to 05/28	751	94
	5	10/16 to 05/28	37	100
Diamond Valley	40	10/01 to 11/30	80	100
Sand Wash	4	11/16 to 05/31	26	100
Note: These numbers reflect the entire allotment. Allotments have areas both inside and outside the NCA.				



Fire Management Response - Red Cliffs NCA

Fire Management Category

- Category A - Wildland fire is not desired at all
- Category C - Wildland fire is managed to meet multiple objectives and prescribed fire is permitted in this category

National Conservation Area Boundary

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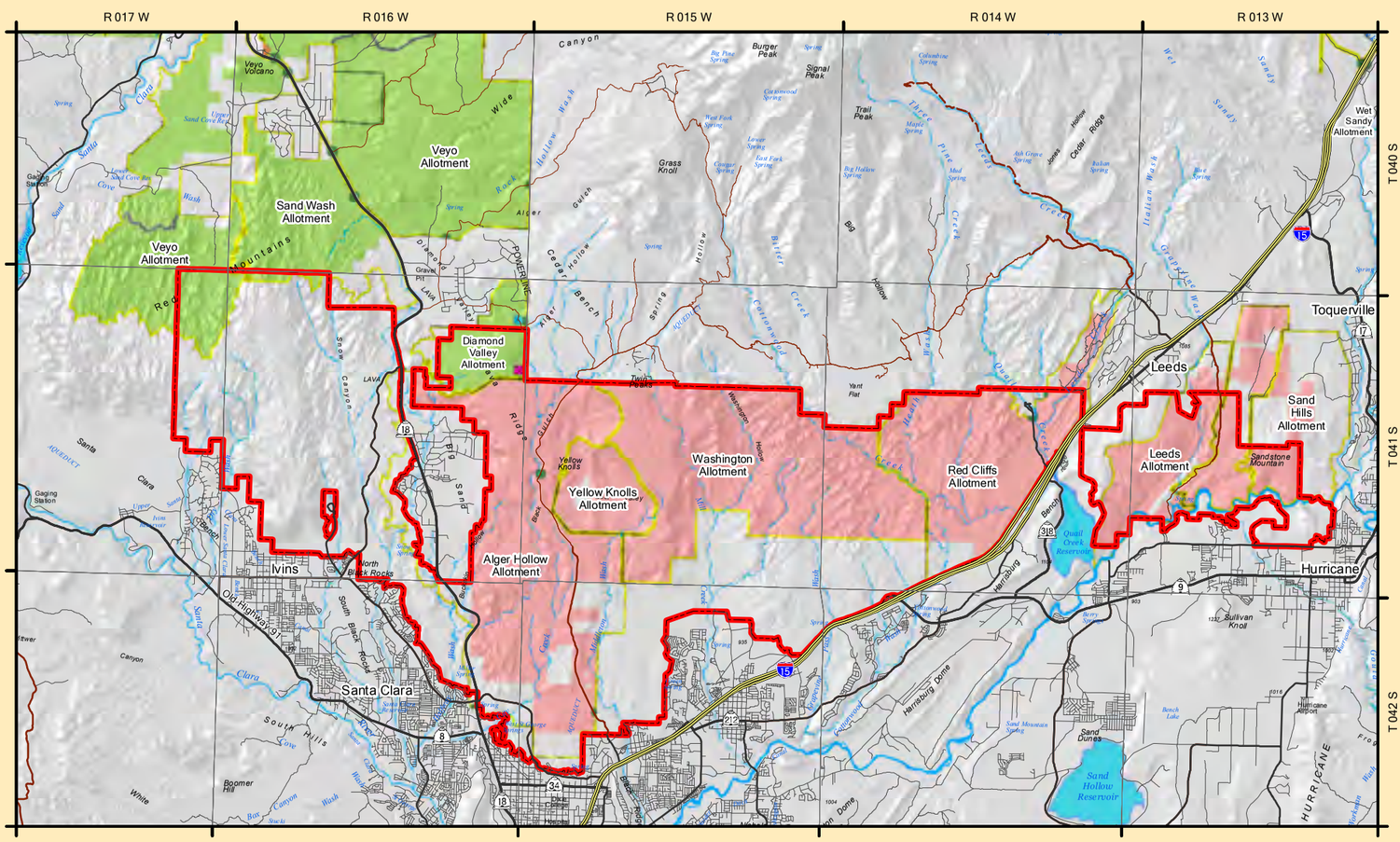
Location Map



Livestock Grazing Allotments - Red Cliffs NCA

- Cattle Guard
- Corral
- Rain Gauge
- Range Study Site

- Fence
- Grazing Allotment Boundary
- Grazing Pasture Boundary
- National Conservation Area Boundary

Allotment Status

- Available for Grazing
- Unavailable for Grazing

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0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

Location Map

"Portions of the Veyo, Sand Wash, and Diamond Valley allotments are located within the boundaries of the Red Cliffs NCA and these allotments continue to be available for livestock grazing."

grazing, being comprised primarily of steep-sided cliffs, slick rock, and sand dunes. There are no permanent water sources and forage production is very limited in the NCA/Wilderness portion of the allotment. Although approximately 36 livestock AUMs and 25 wildlife AUMs have been allocated within the NCA, livestock do not utilize this portion of this allotment as there are other areas outside of the NCA that are more accessible and better suited to grazing.

3.31.1.2 Sand Wash Allotment

The Sand Wash Allotment is approximately 3,900 acres in total size. The grazing permit authorizes four head of cattle to be grazed from November 16 to May 31 annually. Approximately 220 acres of the allotment are within the NCA, but this acreage is not well suited to livestock grazing. Some of the terrain is inaccessible to cattle due to steep-sided cliffs and slickrock. There are no permanent water sources and forage production is very low in the NCA portion of the allotment; livestock rarely graze this area. Of the total AUMs allocated for this allotment, only 5 livestock AUMs and 2 wildlife AUMs are within the NCA.

3.31.1.3 Diamond Valley Allotment

The Diamond Valley Allotment is comprised of 1,800 acres of BLM-managed land and 280 acres of state land, for a total of 2,080 acres. The federal grazing permit authorizes 40 head of cattle to be grazed from October 1 to November 30. Approximately 1,200 acres of this allotment are within the NCA, for which 70 livestock AUMs and 40 wildlife AUMs have been allocated. This allotment is also not well suited to livestock grazing due to its topography, lack of permanent or developed water sources, and low forage production potential. A majority of the allotment acreage within the NCA is inaccessible to cattle due to steep-sided cliffs and extensive areas of exposed slick rock and lava flows. This livestock operator that holds the grazing permit on this allotment has elected not to graze this allotment on an annual basis since 1984.

3.32 VEGETATION RESOURCE USES: PLANT MATERIALS

The reader is referred to the Affected Environment for Beaver Dam Wash NCA for a description of the types of plant materials from public lands that are generally available for harvesting or collection for commercial purposes and personal use.

3.32.1 Woodland Products, Desert Vegetation Sales, and Native Seed Collection

The public lands of today's Red Cliffs NCA have been closed to the harvest of Christmas trees, fuel wood, pole and post products, and to the sale and/or collection of live desert plants for commercial purposes and personal use since 1999, through management decisions from the SGFO RMP. Native seed collection has only been permitted for scientific research purposes. Native Americans have continued to have access for plant materials collection for sacred, ceremonial, and traditional cultural use. Management decisions in the 1999 SGFO RMP implemented these closures to prevent habitat loss and new surface disturbances related to the harvesting or collection of plant materials that could negatively impact desert tortoise habitat and populations in support of Washington County's HCP.

3.33 SPECIAL STATUS SPECIES

Special status species are defined by BLM as any of the following: (1) species listed under the federal ESA as threatened or endangered by the USFWS; species that are candidates and proposed for listing under the ESA; species that have been delisted under ESA within the past 5 years; species identified by the USFWS as "sensitive" or a "species of concern"; and (2) species designated by the appropriate BLM State Director as sensitive species that require special management consideration to promote their conservation and reduce the likelihood of future listing under the ESA.

Species that are listed as threatened and endangered under the ESA will often have critical habitat designated by the USFWS and a recovery plan prepared by the USFWS, in cooperation with researchers who have specialized expertise with that particular species and its habitat. BLM works cooperatively with USFWS to manage suitable habitat for those listed species for which no critical habitat has yet been identified or designated.

Because the NCA lies within physiographic and ecoregional transition zones, many plant and animal species found here are at the extremes of their historic ranges. Such species tend to have less stable populations than those closer to the center of their range. The unique qualities of transitional habitats make them an important research area for special status species. The diverse ecological zones represented in the NCA include relatively large areas of undisturbed habitats that provide opportunities for species reintroductions and establishment of new populations of special status species.

The following sections address those species in the NCA that are currently being managed under the protections of the ESA. Species that are identified by the Utah BLM State Director as sensitive species are described in section 3.32.3.

Other species of concern that are considered by BLM to be special status species include plant, animal, or fish species that are identified by the BLM State Director in each state as sensitive. Sensitive species are described under a separate section of this chapter.

This section will not repeat information about the life histories and habitat requirements for threatened, endangered, or candidate species where this information has been provided in the Affected Environment section for the Beaver Dam Wash NCA. This section will describe species' population data or trends or other factors that are specific to the Red Cliffs NCA and provide information about those special status species and their habitats that are not found in Beaver Dam Wash NCA.

Photo 3-132 Shivwits Milkvetch, Federally-Listed Endangered Species

3.33.1 Special Status Plant Species: Threatened, Endangered, Candidate, and Species Proposed for Listing under ESA

The ESA provides legal protections for native plant species only on federally-managed lands, making the management of these lands for conservation and protection of listed native plants crucial for their survival, recovery, and delisting.

3.33.1.1 Shivwits Milkvetch

Shivwits milkvetch (*Astragalus ampullarioides*), also known as Hermit milkvetch, is a perennial forb that is endemic to Washington County, Utah (Photo 3-132). It was listed as an endangered species in 2001 (USFWS 2001) as a result of declining populations and habitat loss. Six populations of Shivwits milkvetch are known, all located in Washington County, Utah. Threats to this species include developments on private and state lands that provide habitat, OHV activities, livestock grazing, and habitat alteration by invasive annual brome grasses. Critical habitat

Shivwits Milkvetch

Astragalus ampullarioides is a member of the legume family, as indicated by its pinnately compound leaves, keeled flowers, and fruit in the form of a pod. It grows between eight and twenty-six inches in height and produces numerous cream-colored flowers in April or May.

for Shivwits milkvetch was designated in 2006 (USFWS 2006) and a recovery plan was developed by the USFWS in that same year.

This milkvetch has very specific habitat requirements, growing only in isolated pockets of purple-hued, gypsum-rich clay soils in creosote-bursage and Utah juniper communities. Shivwits milkvetch can be fertilized via pollinators or through self-fertilization; however, studies indicate that self-fertilized fruit bear significantly less seed than insect pollinated flowers. Several native bees have been observed pollinating Shivwits milkvetch including *Anthophora coptognatha*, *A. dammersi*, *Eucera quadricinata*, *Bombus morrisoni*, *Osmia clarescens*, *O. marginata*, and *O. titusi* (Tepedino 2005).

In the NCA, Shivwits milkvetch critical habitat totals 422 acres, and is located on the Harrisburg Bench and along the White Reef, as shown on Map 3-40. Studies of plant densities over the past 10 years at Harrisburg Bench indicate that populations have varied considerably from year to year (probably because of varying precipitation) but that populations appear to be stable. Population densities at Harrisburg Bench ranged from 0.73 to 3.40 plants per square meter with an average of 1.28 plants per square meter (Searle and Yates 2010).

3.33.2 Special Status Wildlife Species: Threatened, Endangered, Candidate, and Species Proposed for Listing under ESA

Species that are listed as threatened and endangered under the ESA will often have critical habitat designated by the USFWS. For listed species that have not yet had critical habitat identified and designated, BLM works cooperatively with the USFWS to manage habitats to support these species.

3.33.2.1 Virgin River Chub & Woundfin

Virgin River chub (*Gila seminude*) and woundfin (*Plagopterus argentissimus*) are native fish of the Virgin River system; both fish are listed as endangered species (USFWS 1989b) due to declining populations and habitat degradation. Critical habitat for the Virgin River chub and woundfin was designated in 2000 (USFWS 2000) and includes the main-stem of the Virgin River and its 100 year floodplain, extending from the confluence of LaVerkin Creek, Utah to Halfway Wash, Nevada. Both fish are found in the reach of the Virgin River that flows through the NCA (Map 3-41). As the two species occupy the same critical habitat, face the same threats, and are included in the same recovery plan prepared by the USFWS, they are discussed together here.

The Virgin River chub is a silvery, medium sized minnow that averages about 8 inches in total length but can grow to a length of 18 inches. Habitat for this chub is deep runs or pools of slow to moderate velocities with large boulders or in-stream cover, such as root snags (USFWS 1995).

Woundfin are found in the main-stem of Virgin River and the lower portion of LaVerkin Creek in Utah. This small fish is a streamlined, silvery minnow, with a flat head and a conspicuous sharp dorsal spine, from which its common name was derived. They prefer quiet pools near riffles with sand and sand/gravel substrates.

Threats to both species include competition with non-native fish and habitat degradation resulting from diversions, dams, and other structures on the river that elevate water temperatures beyond the tolerance of the fish. Recovery efforts for the Virgin River chub and woundfin are furthered through the Virgin River Recovery Program, a multi-agency program established in 1995 to implement recovery actions, and conserve and protect native species in the Virgin River Basin.

The Virgin River flows for approximately 6 miles through the NCA and provides habitat for both fish species. There are no non-native fish in this reach as downstream fish barriers prevent red shiner

"No human being, however great, or powerful, was ever so free as a fish."
–John Ruskin, Art Critic, 1819–1900

(*Cyprinella lutrensis*) and other species from entering. Water temperatures in the reach within the NCA can be very high during the summer (peak daily temperature above 95° F, mean daily temperature greater than 84° F) (Addley et al. 2005), but the fish populations do not appear to be negatively impacted at this time.

3.33.2.2 Southwestern Willow Flycatcher

The reader is referred to the Affected Environment for the Beaver Dam Wash NCA for information on the factors that resulted in the listing of the Southwestern willow flycatcher and its current status.

Southwestern willow flycatchers may utilize the riparian vegetation along the Virgin River, Leeds and Quail Creeks, or in some ephemeral washes in the NCA, but there have not been confirmed sightings. None of these riparian zones are within designated critical habitat for this species. There are no known willow flycatcher nests within the NCA, although each of the riparian zones could provide opportunities for nesting. Tamarisk and giant reed have invaded the riparian areas of the NCA, but are not so widespread as to measurably degrade the quality of habitat for the birds.

3.33.2.3 Western Yellow-billed Cuckoo

The reader is referred to the Affected Environment for the Beaver Dam Wash NCA for information on the factors that resulted in the listing of the western yellow-billed cuckoo and its current status.

These cuckoos prefer riparian habitats with dense cottonwood or willow stands (UDWR 2014). The riparian zones along the Virgin River and Leeds and Quail Creeks do not provide the size or quality of habitats preferred by these birds for nesting or foraging. There have not been sightings within the NCA, although cuckoos have been observed along the Virgin River and some tributaries (Audubon and Cornell Lab of Ornithology 2013).

3.33.2.4 California Condor

The reader is referred to the Affected Environment for the Beaver Dam Wash NCA for information on the factors that resulted in the listing of the California condor and its current status.

California condors are not known to nest or have special use sites in the NCA. Occasional overflights by condors and possible perching along the Virgin River have been reported (The Peregrine Fund 2012; Audubon and Cornell Lab of Ornithology 2013). If these reports are accurate, birds observed south and east of I-15 would be considered part of the experimental, non-essential population of birds that are being bred in captivity and released in the wild on the Arizona Strip.

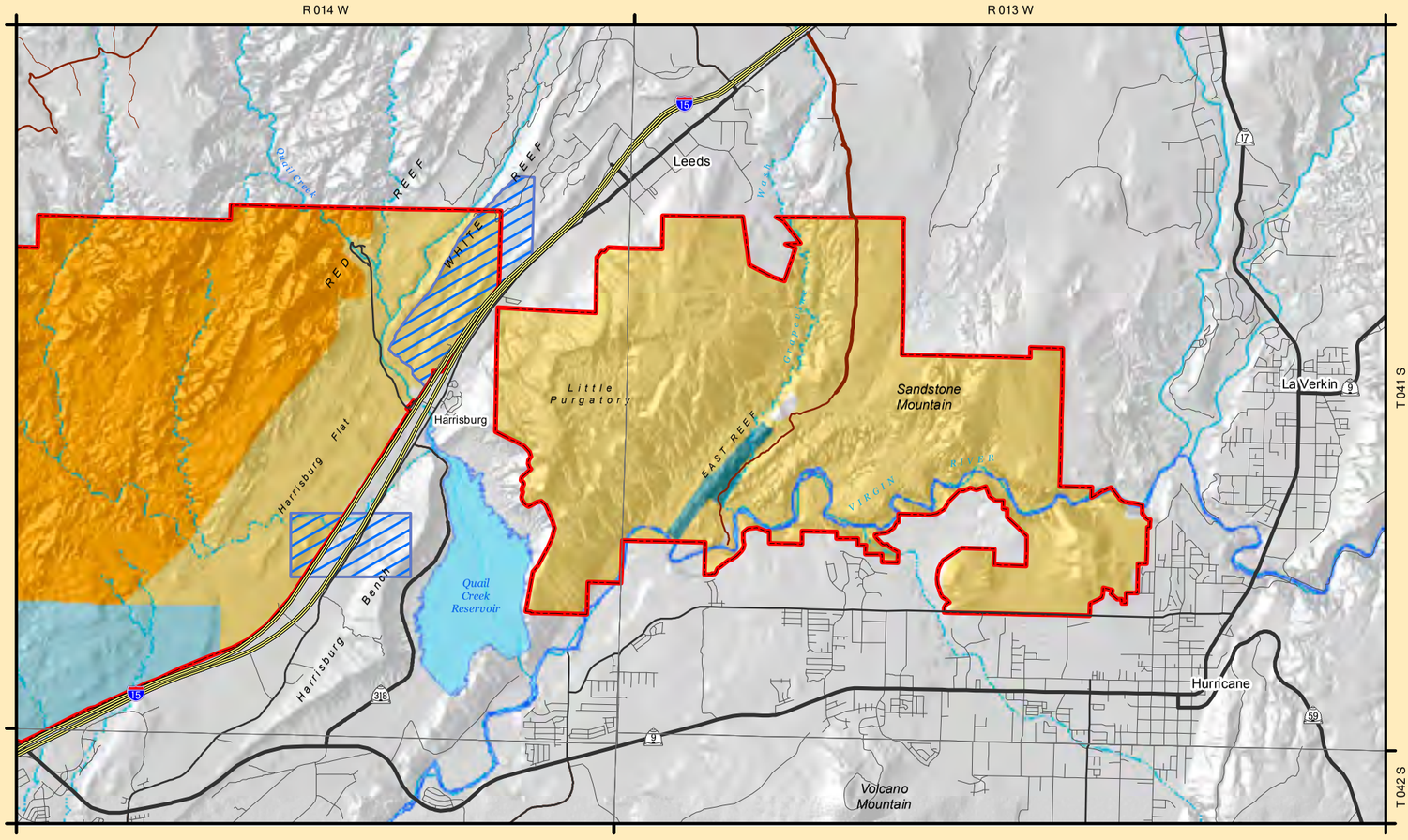
3.33.2.5 Mojave Desert Tortoise

The reader is referred to the Affected Environment for the Beaver Dam Wash NCA for information on the factors that resulted in the listing of the desert tortoise and the life history of the species. As there are differences related to habitats and population trends in Red Cliffs NCA, a detailed discussion of the differences is included below.

The NCA is located within the Upper Virgin River Recovery Unit for the desert tortoise, initially identified in the 1994 Mojave Desert Tortoise Recovery Plan. This recovery unit is approximately 54,750 acres in size, making it the smallest of the tortoise recovery units. Of the total acres, approximately 46,126 acres are designated critical habitat; a majority of the designated critical habitat is within the NCA while the remainder is located adjacent to it on the Shivwits Indian Reservation and on private land near the cities of Ivins and Hurricane. Map 3-42 displays designated critical tortoise habitat in the NCA; Map 3-43 displays a model of habitat quality variations within the NCA.

The 1999 SGFO RMP contained management decisions designed to assist the

"California condors are not known to nest or have special use sites in the Red Cliffs NCA."



Designated Critical Habitat - Shivwits Milkvetch - Red Cliffs NCA

- Shivwits Milkvetch Critical Habitat (FWS)
- National Conservation Area Boundary
- BLM Wilderness Area
- Bureau of Land Management
- State
- State Wildlife Reserve/Management Area

Source: U. S. Department of Interior, U. S. Fish and Wildlife Service, Critical Habitat for Shivwits milk-vetch, 2008

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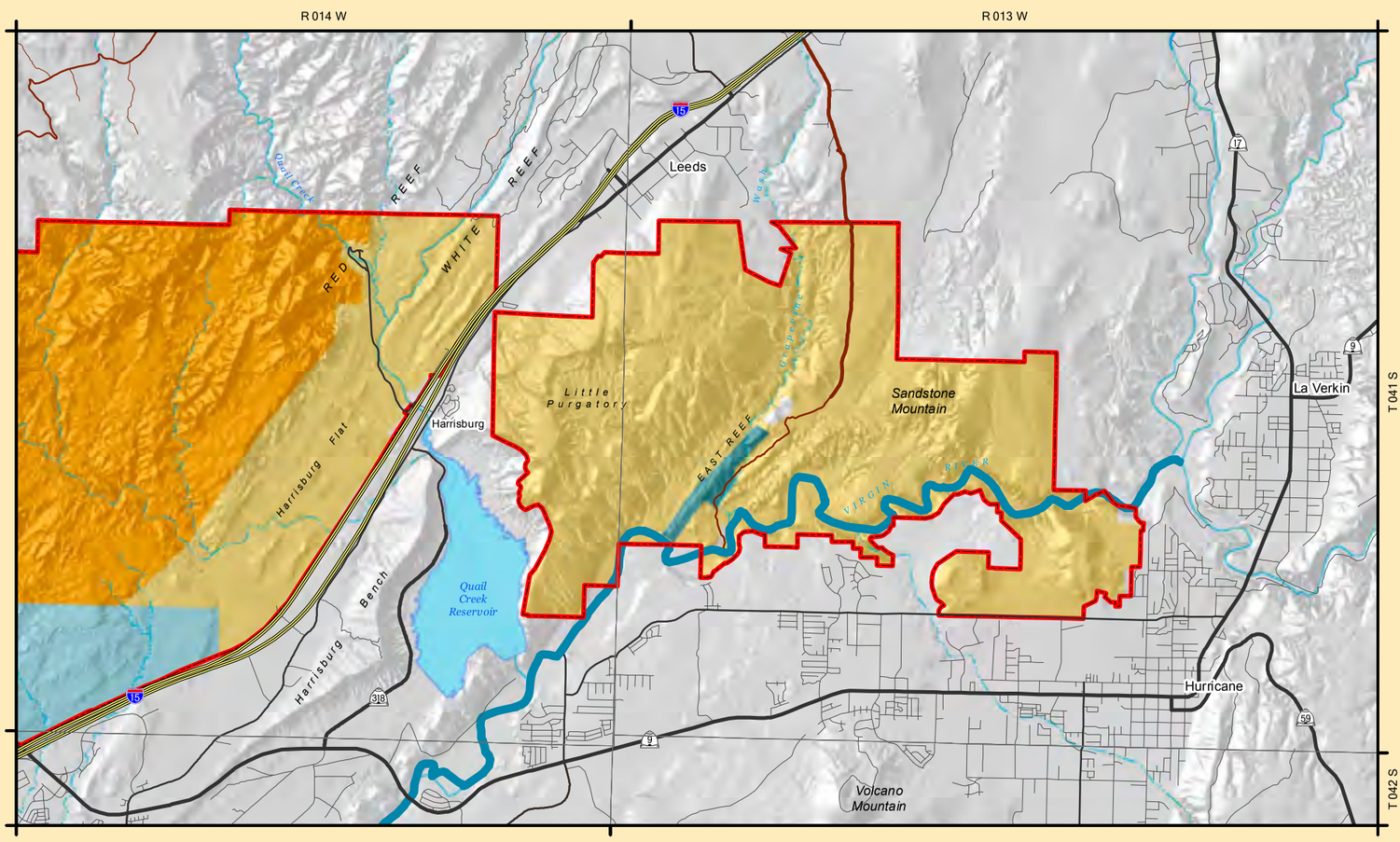
0 0.25 0.5 1 Kilometers

Location Map



Designated Critical Habitat - Virgin River Chub & Woundfin - Red Cliffs NCA

- Virgin River Chub and Woundfin Critical Habitat (FWS)
- National Conservation Area Boundary
- BLM Wilderness Area
- Bureau of Land Management
- State
- State Wildlife Reserve/Management Area

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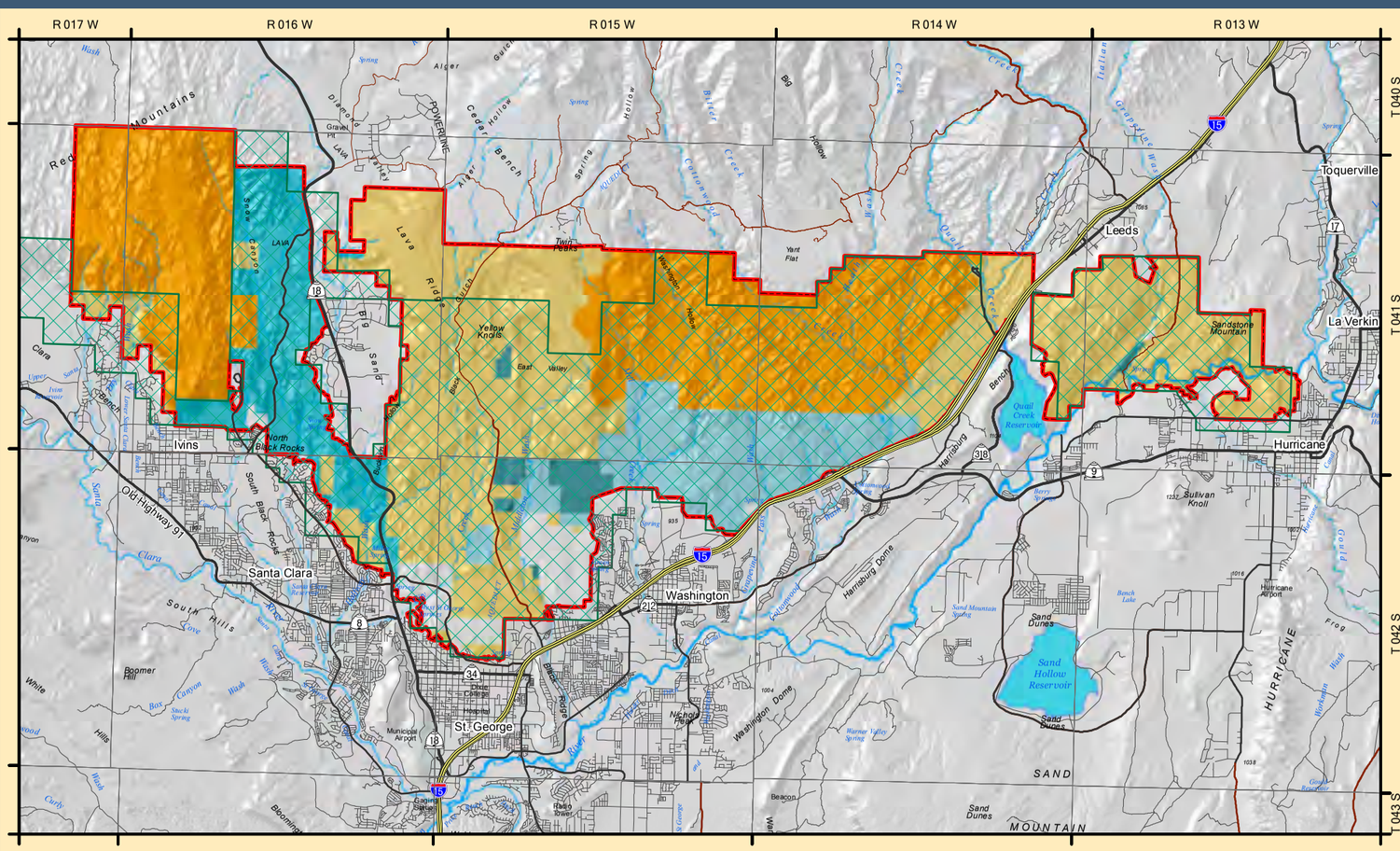
Source: U.S. Department of Interior, U. S. Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Woundfin and Virgin River Chubs, January 2000

0 0.25 0.5 1 Miles
0 0.25 0.5 1 Kilometers

Location Map



Designated Critical Habitat - Desert Tortoise - Red Cliffs NCA

- Desert Tortoise Critical Habitat (FWS)
- National Conservation Area Boundary
- BLM Wilderness Area
- Bureau of Land Management
- State
- State Parks and Recreation
- State Wildlife Reserve/Management Area

Source: U.S. Department of Interior, U. S. Fish and Wildlife Service, Critical Habitat for Desert Tortoise, 2010

This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.

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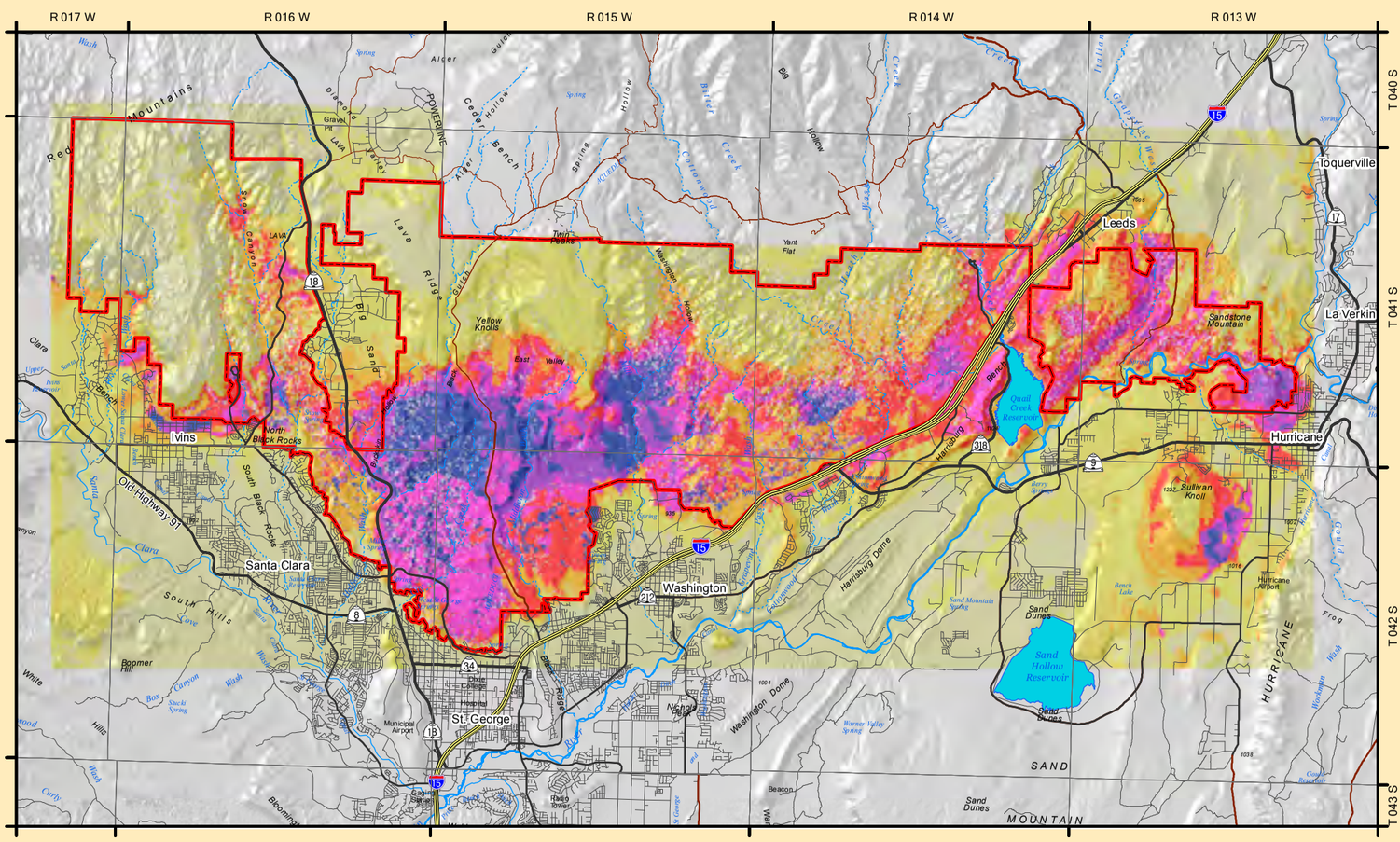
Note: Decisions in this document only apply to BLM lands

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

Location Map



Modeled Desert Tortoise Habitat - Red Cliffs NCA

Probability of High Quality Desert Tortoise Habitat

- 0 - 5%
- 5 - 20%
- 20 - 35%
- 35 - 50%
- 50 - 65%
- 65 - 80%
- 80 - 100%
- National Conservation Area Boundary

Source: Utah Department of Natural Resources in Cooperation with The Nature Conservancy, Modeling Desert Tortoise Habitat for Washington County's National Conservation Areas, Jones & Edwards, 2013

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Location Map

recovery and delisting of desert tortoise populations in the Upper Virgin River Recovery Unit, based on recommendations from the recovery plan. These same decisions were also intended to further the goals and objectives of Washington County's multi-species *Habitat Conservation Plan* (HCP), approved by the USFWS in 1995. The HCP formed the basis for the issuance of an incidental take permit (ITP) to the county that allows for the orderly development of non-federal lands within critical habitat and the incidental "take" of tortoises related to that development.

The HCP identified that the primary mitigation measure for the county's ITP was to be the establishment and protective management of a 62,000 acre "reserve" to assist the recovery and delisting of desert tortoise in the Upper Virgin River Recovery Unit. This "reserve," locally known as the Red Cliffs Desert Reserve (Reserve), was comprised of lands managed by BLM, the State of Utah, Washington County, and local municipalities. The public lands of today's Red Cliffs NCA are approximately 70% of the land base of the Reserve, which was established in 1996, when BLM, USFWS, the State of Utah, Washington County, and the City of Ivins signed an HCP Implementation Agreement.

Management decisions in the 1999 SGFO RMP restricted land uses and authorized activities on the public lands within the Reserve to further the goals and objectives of the HCP. The implementation-level PUP was developed in 2000 to address recreation and other public uses within the Reserve. Since approval of the HCP, Washington County has assisted the various land management agencies to protect habitat, monitor desert tortoise populations, provide law enforcement, and conduct public education outreach related to desert tortoise and other at-risk Mojave Desert species.

Habitat

The Beaver Dam Wash NCA and Red Cliffs NCA are underlain by very different geologic and soil substrates that influence how and where tortoises can dig their burrows. The alluvial fans of the Beaver Dam Wash NCA are dissected by many deep ephemeral washes whose side slopes are composed of soil and rock conglomerate layers, interspersed by hardpans (calcium carbonate, also known as "caliche").

Tortoises are able to dig deep burrows into the sides of the washes, in the softer layers between the caliche deposits. By contrast, the landscape of Red Cliffs NCA lacks large ephemeral washes and many areas are covered by exposed bedrock, lava flows, sand dunes, and shallow sandy soils over bedrock. Tortoises must dig down as deeply as possible into the soil to create burrows or dens in south-facing locations that will provide shelter from both summer heat and the colder winter temperatures of Red Cliffs NCA (Photo 3-133).

Like habitat in the Beaver Dam Wash NCA, tortoise habitat here has been impacted by recent and large wildfires (Photo 3-134). Following the fires of 2005 and 2006, UDWR field inventories identified tortoise mortalities that were directly attributed to the effects of the fires (McLuckie, Bennion, and Fridell 2006). Non-native annual grasses fueled these fires and have become dominant in fire-damaged landscapes. The non-native grasses are poor forage for the tortoises. Although individual tortoises can survive in brome-dominated areas, it is unclear whether or not they have sufficient nutrition to reproduce at or above replacement levels.

Population Trends

Historic population data for the Red Cliffs NCA tortoise population is sparse. Tanner (1927) listed desert tortoise as being present in "St. George" but did not provide the specific locations of his observations. Woodbury and Hardy (1948) asserted that tortoises in the St. George Basin were introduced.

In 1972, Coombs began studying desert tortoise on the Beaver Dam Slope and around St. George. Like Woodbury and Hardy, Coombs felt that the tortoise in the St. George area were recent introductions—he cited Woodbury's 1945 paper, as well as Woodbury and Hardy's 1948 publication, in addition to personal communication with Ross Hardy (1975). His research showed that the St. George population of tortoises contained a moderate number of medium-large to very large adults, very few medium adults, and a great many adolescents, very small immature tortoises, and hatchling tortoises. Coombs concluded that this was indicative of a population that was introduced: the medium-large to very large adults were introduced, had low reproductive rates for a time while the population was adjusting to the new area (evidenced by the small number of "medium adults"), then began to reproduce rapidly as the new population acclimated. Coombs estimated that it would have taken "less than 80 years" from the time of the

"The HCP identified that the primary mitigation measure for the county's ITP was to be the establishment and protective management of a 62,000 acre "reserve." This "reserve," locally known as the Red Cliffs Desert Reserve, was comprised of lands managed by BLM, the State of Utah, Washington County, and local municipalities."

"Like habitat in the Beaver Dam Wash NCA, tortoise habitat in the Red Cliffs NCA has been impacted by recent and large wildfires."

Photo 3-133 Mojave Desert Tortoise Outside Den Entrance, Red Cliffs NCA

© Cameron Rognan

Photo 3-134 Monitoring Desert Tortoise Dens after Wildfire, Red Cliffs NCA

"In 1998, the UDWR was contracted by Washington County to conduct biannual monitoring of tortoise populations in the Reserve, using Line Distance Sampling to estimate tortoise density and abundance."

introduction for the population to reach the level he observed in 1973 and 1974 (Coombs 1977). More recent studies have shown that tortoises are not as long-lived as Coombs and others initially believed, with few adults surviving more than 50 years (Germano 1992, 1998). This current knowledge would likely have altered Coombs' estimates of when a founder population might have been released.

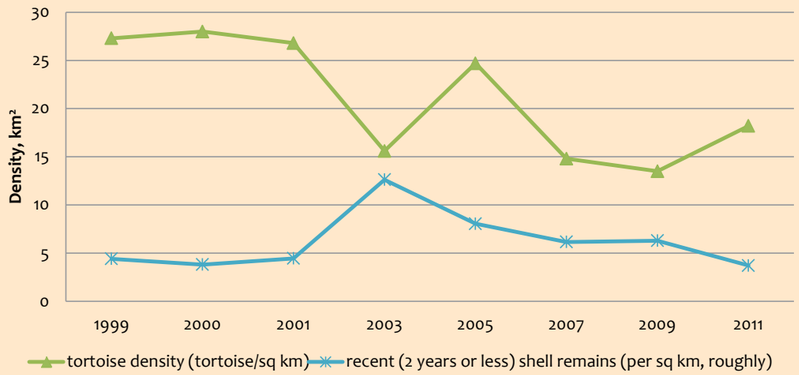
The habitat in Red Cliffs NCA is clearly suitable for desert tortoise and it is entirely possible that tortoises were native to and present in the area, but not documented during the early studies by Woodbury and Hardy or others. There are a number of documented instances where areas were surveyed for tortoises, with none found, only to have tortoises located in the same area later. In the Babylon-East Reef area of the NCA, field surveys indicated that the area was not occupied by tortoises and would be a suitable re-location area for "take" tortoises that were being removed from non-federal lands ahead of developments, under the authority of Washington County's ITP. All of the released "take" tortoises were given permanent markers. Recent field studies have identified unmarked tortoises in this area as well, most of them too large to be the offspring of the "take" animals. These unmarked tortoises may have always been present in Babylon but were missed by prior surveys, or they may have been captive tortoises that have been illegally released (McLuckie, Emblidge, and Fridell 2010).

In 1998, the UDWR was contracted by Washington County to conduct biannual monitoring of tortoise populations in the Reserve, using Line Distance Sampling to estimate tortoise density and abundance. This method was chosen as it reduces or accounts for human error, and samples tortoises both in high and low density sites. Figure 3-5 displays tortoise population trends developed by UDWR monitoring (McLuckie, Ratchford, and Fridell 2012).

Based on UDWR monitoring data, tortoise densities appeared to decline markedly between 2001 and 2003. The decline coincided with a severe drought in 2002, and was confirmed by evidence of tortoise mortalities that were suspected to have been directly caused by a contagious tortoise URD; tortoises weakened by dehydration and starvation were more susceptible to the disease, allowing the disease to reach epidemic proportions in an otherwise healthy population (McLuckie, Bennion, and Fridell 2006).

In 2005 and 2006, severe wildfires impacted tortoise populations and declines were noted in the next monitoring cycle. Tortoise densities detected in 2007 showed a further decline of the population, with mortalities attributed to the fires (Photo 3-135). Some of the surviving tortoises were observed to have burn

Figure 3-5 Tortoise Population Trends, 1999-2011



scarring and other fire-related injuries (McLuckie et al. 2005).

The most recent monitoring data suggest that the tortoise population in the Reserve has stabilized (McLuckie, Huizinga, and Fridell 2013). Individuals with the greatest susceptibility to URD have succumbed to the infection and the lower population density has possibly reduced transmission rates. Much valuable tortoise forage has been replaced by annual grasses, which provide poor nutrition, but the effects of nutritional deficiencies will not be as quickly detected in the short term (McLuckie, Ratchford, and Fridell 2012).

3.33.3 Utah BLM Sensitive Species

A majority of the BLM sensitive species that are found in the Beaver Dam Wash NCA also occur in Red Cliffs NCA. Life histories and habitat requirements have previously been described in the Affected Environment of the Beaver Dam Wash NCA and are not repeated here. Rather, information about verified sightings and the locations where a specific species has been observed in Red Cliffs NCA is included in this section. Where a BLM sensitive species is not found in Beaver Dam Wash NCA but does occur in Red Cliffs NCA, information is provided below about its life history and habitat requirements.

Photo 3-135 Suspected Fire-related Tortoise Mortality, Red Cliffs NCA

Photo 3-136 Virgin River Thistle, BLM Sensitive Species

3.33.3.1 Plants

Virgin River Thistle

One occurrence of the Virgin River thistle (*Cirsium virginense*) (Photo 3-136) has been documented at a location that may be within the NCA, on the hilly slopes north of St. George (Utah Natural Heritage Program 2011). This thistle grows in saline soils and is found along stream channels and the Virgin River.

3.33.3.2 Fish

Flannel-mouth Sucker

The flannel-mouth sucker (*Catostomus latipinnis*) is found in the Virgin River, including the reach through the NCA. This sucker is a bottom dwelling fish that consumes algae, other types of plant matter, and invertebrates. It spawns over gravelly areas during the spring and early summer. Flannel-mouth suckers prefer large rivers, where they are often found in deep pools of slow-flowing, low gradient reaches (UDWR 2014). The species is considered a BLM sensitive species due to declining population numbers and distribution, caused primarily by habitat loss/alteration and the introduction of nonnative fishes.

Virgin Spinedace

The Virgin River spinedace is found in the Virgin River and in Leeds Creek in the NCA, with populations monitored by UDWR (UDWR 2008).

Virgin River Thistle

Cirsium virginense is a member of the sunflower family, growing between two to seven feet in height. Flowering can occur from June to October and blooms range in color from white to pink or lavender. Virgin River thistle is also known as Mojave thistle (*Cirsium mohavense*) and Rusby's thistle (*Cirsium rusbyi*).

Bald Eagle

Haliaeetus leucocephalus is the national bird of the United States. These regal birds are large—with a wing span of 72 to 96 inches and weighing between ten and 14 pounds. Bald eagles build equally large nests of sticks, one of the largest in the avian world. (National Geographic 2014)

Photo 3-137 Bald Eagle, BLM Sensitive Species

3.33.3.3 Raptors

Bald Eagle

Bald eagles (Photo 3-137) are winter migrants in Washington County and have been sighted along Quail Creek and the Virgin River in the NCA (Audubon and Cornell Lab of Ornithology 2013). Eagle nests have not been identified in the NCA, however, the riparian areas of the Virgin River, Leeds Creek, and Quail Creek provide habitat that would be suitable for nesting.

Ferruginous Hawk

Habitat for this raptor includes the Virgin River, Leeds Creek, and Quail Creek within the NCA. Although no nesting sites have yet been identified, potential nesting habitat is available at higher elevations of the NCA. These birds have been sighted at the Red Cliffs Recreation Area campground, at locations along Cottonwood Road, and elsewhere in the NCA (Audubon and Cornell Lab of Ornithology 2013).

3.33.3.4 Other Sensitive Bird Species

Lewis's woodpecker

There are no recorded sightings of this species in the NCA, but they have been observed at a location very close to its southern boundary (the Dixie Red Hills Golf course) and suitable habitat exists within the NCA (Audubon and Cornell Lab of Ornithology 2013). Use within the NCA could occur during the winter months along the Virgin River, Leeds Creek, and Quail Creek.

3.33.3.5 Migratory Birds and Birds of Conservation Concern

A list of 133 migratory birds and Birds of Conservation Concern that have been observed in Red Cliffs NCA is provided in Appendix G. The Virgin River, Leeds Creek, and Quail Creek riparian areas provide important habitats for many species of migratory birds and Birds of Conservation Concern.

3.33.3.6 Mammals

Fringed Myotis

The fringed myotis inhabits caves and mines, most often in desert and woodland areas. It is known to occur in Red Cliffs NCA, but population numbers or trends are unknown (Utah Natural Heritage Program 2011).

Kit Fox

The kit fox is known to occur in Red Cliffs NCA, but population numbers or trends are unknown (Utah Natural Heritage Program 2011).

Townsend's Big-eared Bat

The Townsend's big-eared bat is known to occur in Red Cliffs NCA, possibly roosting in caves and abandoned mines (Utah Natural Heritage Program 2011). The Virgin River, Leeds Creek, and Quail Creek offer the best opportunities for Townsend's big-eared bat to be sighted; population numbers or trends are unknown.

Photo 3-138 Gila Monster, BLM Sensitive Species

3.33.3.7 Reptiles

Common Chuckwalla

The common chuckwalla is a large lizard that consumes the leaves, flowers, and shoots of annual and perennial plants in the Mojave Desert. Its preferred habitat includes rock outcrops and lava flows; this species has been observed in Paradise Canyon and other rocky areas of the NCA (Utah Natural Heritage Program 2011).

Gila Monster

Gila monsters (Photo 3-138) are found in the eastern portion of the NCA, near Babylon-East Reef (Utah Natural Heritage Program 2011). As they are also present in Snow Canyon State Park, these large lizards could be found at many other locations in the NCA.

Sidewinder

These small rattlesnakes (Photo 3-139) are present in the NCA, in areas like Babylon-East Reef and Yellow Knolls (Utah Natural Heritage Program 2011). They are rarely seen but leave very visible, distinctive tracks in the sand.

Western Banded Gecko

Western banded geckos are present in the NCA but population trends or numbers are not known (Utah Natural Heritage Program 2011).

Western Thread-snake

This species (Photo 3-140) is present in the NCA, but population trends and numbers are unknown (Utah Natural Heritage Program 2011).

3.34 OTHER FISH AND WILDLIFE SPECIES

The Affected Environment for Beaver Dam Wash NCA describes BLM's responsibilities with regard to the management of habitats and fisheries to maintain or increase population numbers and to re-establish populations of native species that were historically present on public lands, working in cooperation with UDWR, USFWS, and wildlife advocacy groups. Life histories and habitat requirements for large and small game, and upland game birds that occur in both NCAs, were described in the Affected Environment for Beaver Dam Wash NCA and will not be repeated here. Information that is specific to Red Cliffs NCA as it relates to other fish and wildlife species is provided in the following section.

3.34.1 Ungulate Species

3.34.1.1 Desert Bighorn Sheep

Desert bighorn sheep are not currently found in the NCA, as the population that was formerly present on Red Mountain was extirpated in the 1960s. However, UDWR continues to classify Red Mountain Wilderness as "Year-long, substantial (Historic)" bighorn sheep habitat (UDWR 2008)(Map 3-44). Reintroduction of bighorn could be authorized into this habitat in the future.

Photo 3-139 Sidewinder, BLM Sensitive Species

Photo 3-140 Western Thread-snake, BLM Sensitive Species

Sidewinder

Crotalus cerastes is a venomous pit-viper distinguished by a prominent triangular projection (supraocular) over each eye. The sidewinder is primarily nocturnal and escapes the excessive heat of the day by burying itself in the sand or hunking down in the burrows of other animals.

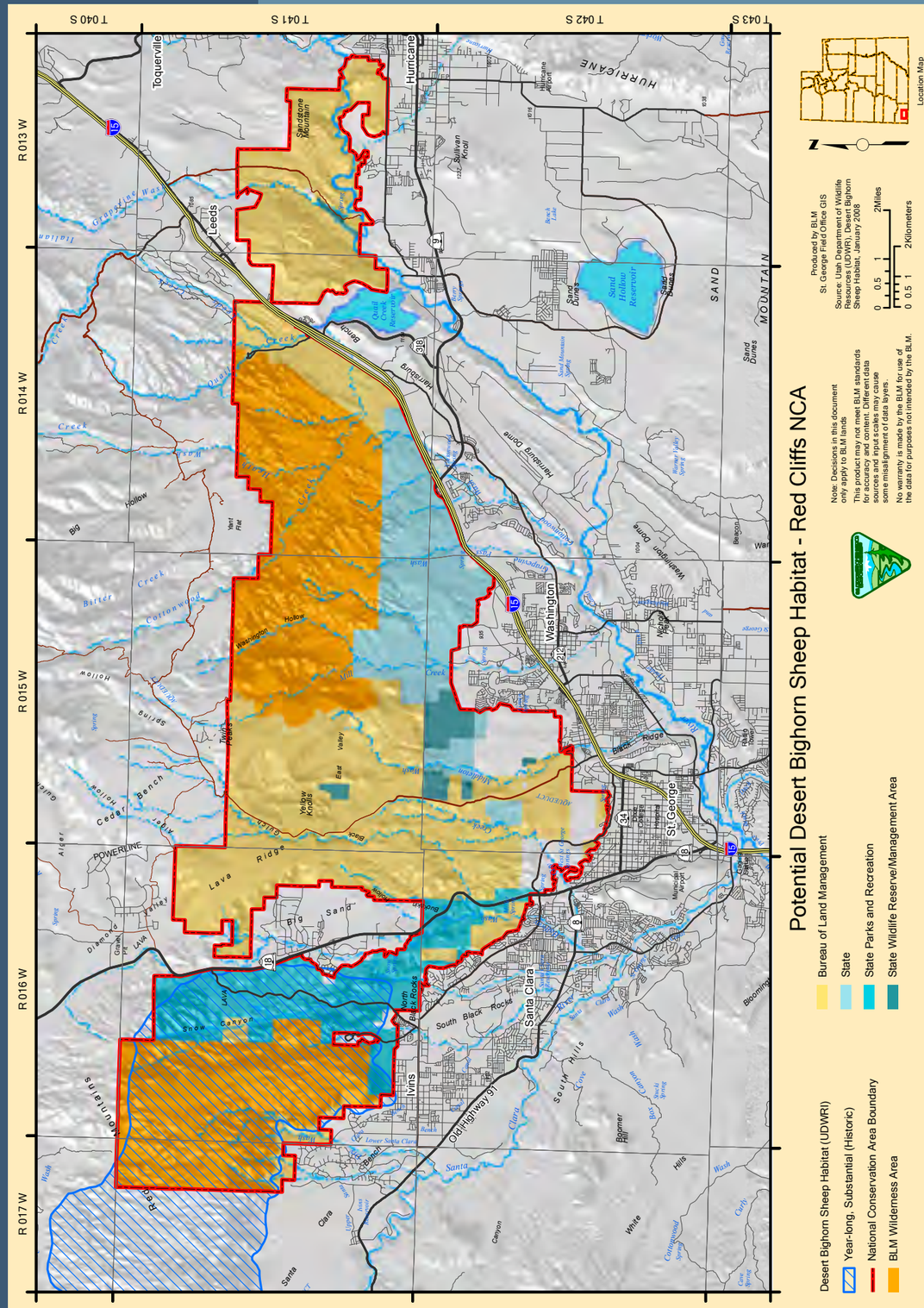


Photo 3-141 Mule Deer Herd, Red Cliffs NCA

3.34.1.2 Mule Deer

The NCA is within UDWR's Pine Valley Deer Management Unit. Mule deer herds (Photo 3-141) utilize the pinyon juniper woodlands and sagebrush steppe of the Pine Valley Mountains during the summer, moving to lower elevations in the NCA during the winter months (UDWR 2012). The northern portion of the NCA is classified as Crucial Deer Winter Range (Map 3-45).

3.34.2 Other Mammals

3.34.2.1 Mountain Lion

Mountain lion are known to be present in the NCA, although numbers are not known.

3.34.3 Upland Game Birds

3.34.3.1 Gambel's Quail

The public lands of the NCA are classified by UDWR as year-long, crucial habitat for Gambel's quail (UDWR 2014). This species was once widespread across southwestern Utah but is currently only found in Washington County. It is a very popular target for hunting in the NCA.

3.34.4 Amphibians

3.34.4.1 Relict Leopard frog

This species (*Lithobates onca*) (Photo 3-142) was once widespread in Washington County but has since been extirpated (Utah Natural Heritage Program 2011). It is still found on the Arizona Strip and in southern Nevada, where it is listed as a candidate species for listing under the ESA (USFWS 2013).

3.35 HERITAGE RESOURCES

The reader is referred to the Affected Environment of Beaver Dam Wash NCA for information about the legal and regulatory frameworks for BLM's management of heritage resources and an overview of regional cultural history.

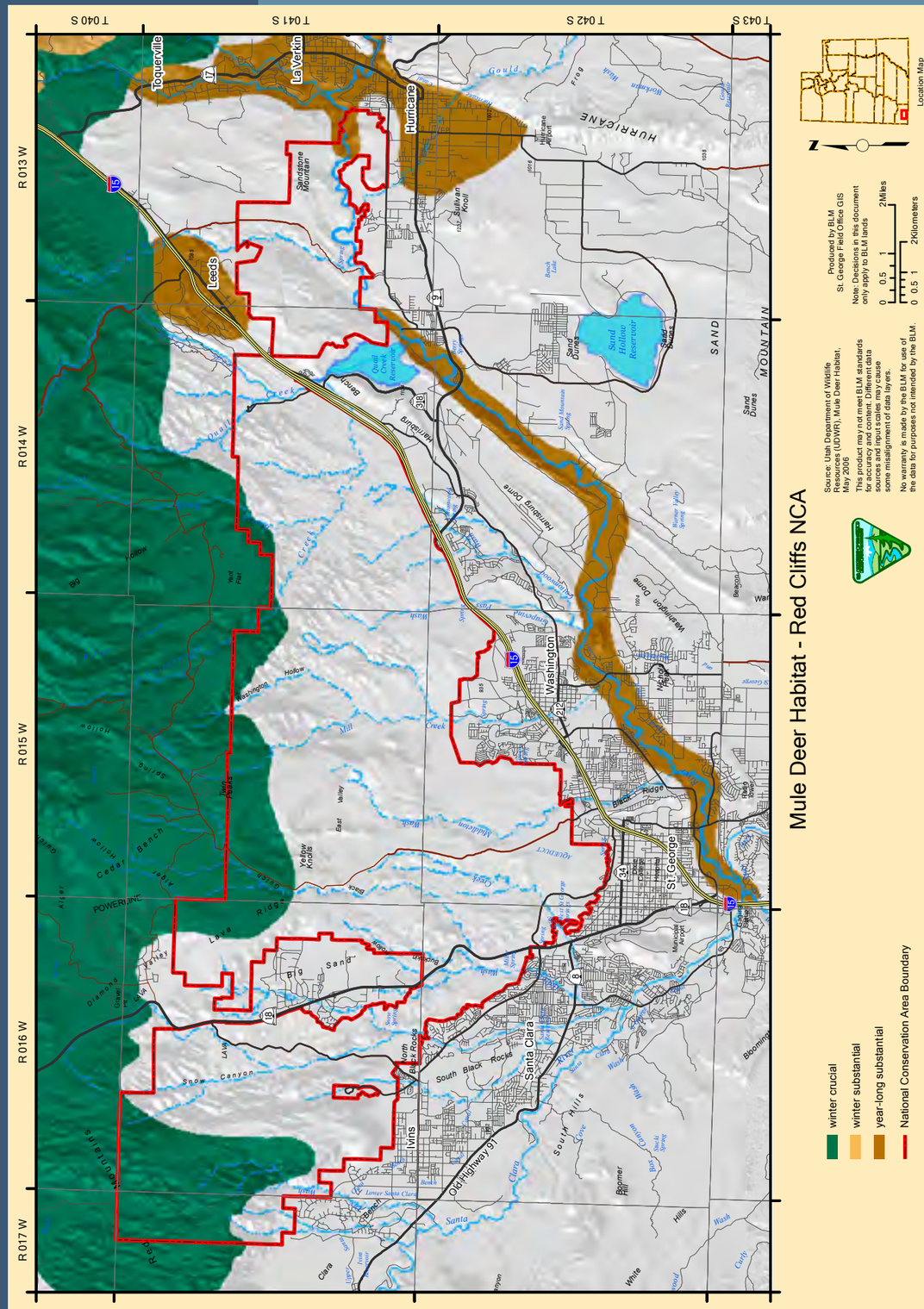
3.35.1 Identification of Heritage Resources in the NCA

Cultural resource Class III investigations have been conducted on approximately 5,631 acres (12.51%) of the 45,000 acre NCA. Through these field inventories, a

Photo 3-142 Relict Leopard Frog, Candidate Species for Listing Under the ESA

Relict Leopard Frog

Lithobates onca generally require shallow water with emergent and perimeter vegetation for foraging and basking, and deeper water, root masses, undercut banks, and debris piles for cover and hibernating shelter. (Relict Leopard Frog Conservation Team 2005)



total of 263 prehistoric and historic period archaeological sites have been documented within the NCA. Project-specific inventories were conducted for power transmission lines, water lines, and other utilities that were authorized by ROWs prior to 1999. High prehistoric site densities were documented within these linear project areas. Archaeological testing and data recovery excavations were completed on 10 prehistoric archaeological sites as mitigation for project-related adverse effects to NRHP-eligible properties.

Class III level field inventories have also been conducted in the eastern portions of the NCA for small fencing projects and recreation facilities-related developments. A large number of historic period sites have been documented in this area that are associated with the mid-19th century Mormon agricultural settlement at Harrisburg and with silver prospecting and mining activities in the Silver Reef District which boomed between 1875 and 1919.

Three heritage sites are managed as public use sites and include trails, visitor amenities, and interpretation. They are all located within the Red Cliffs Recreation Area and include an excavated and stabilized Ancestral Puebloan 10th century habitation site (Photo 3-143), the restored mid-19th century Orson B. Adams House, and a 1950s-era Hollywood movie set, the location for the filming of *They Came to Cordura*.

3.35.2 Site Monitoring

Specific sites in the NCA are regularly monitored by BLM personnel and by trained volunteer site stewards to assess the condition of the site and identify factors (e.g., erosion, recreation uses, and vandalism) that are negatively impacting that resource. Actions are taken to conserve and protect heritage resources that are being impacted and can include stabilization, the installation of protective fencing or barriers, trail re-alignment, or changes to authorized uses that are having negative effects on the site.

3.36 SPECIAL DESIGNATIONS

3.36.1 Special Designations Not Present in the NCA

3.36.1.1 Wild and Scenic Rivers

Congress has not designated any river segments in the NCA to the National Wild and Scenic River System. Seven river segments that are partially or entirely within the NCA were evaluated for eligibility and suitability for inclusion into the National Wild and Scenic River System during the development of the

Photo 3-143 Heritage Site: Ancestral Puebloan Habitation Site, Red Cliffs NCA

"Three heritage sites are managed as public use sites. They are all located within the Red Cliffs Recreation Area and include an excavated and stabilized Ancestral Puebloan 10th century habitation site, the restored mid-19th century Orson B. Adams House, and a 1950s-era Hollywood movie set."

"Wilderness is not a luxury but a necessity of the human spirit."
–Edward Abbey, Author, 1927–1989

SGFO RMP. None were found eligible or suitable, as shown in Table 3-35.

3.36.2 Designated Wilderness

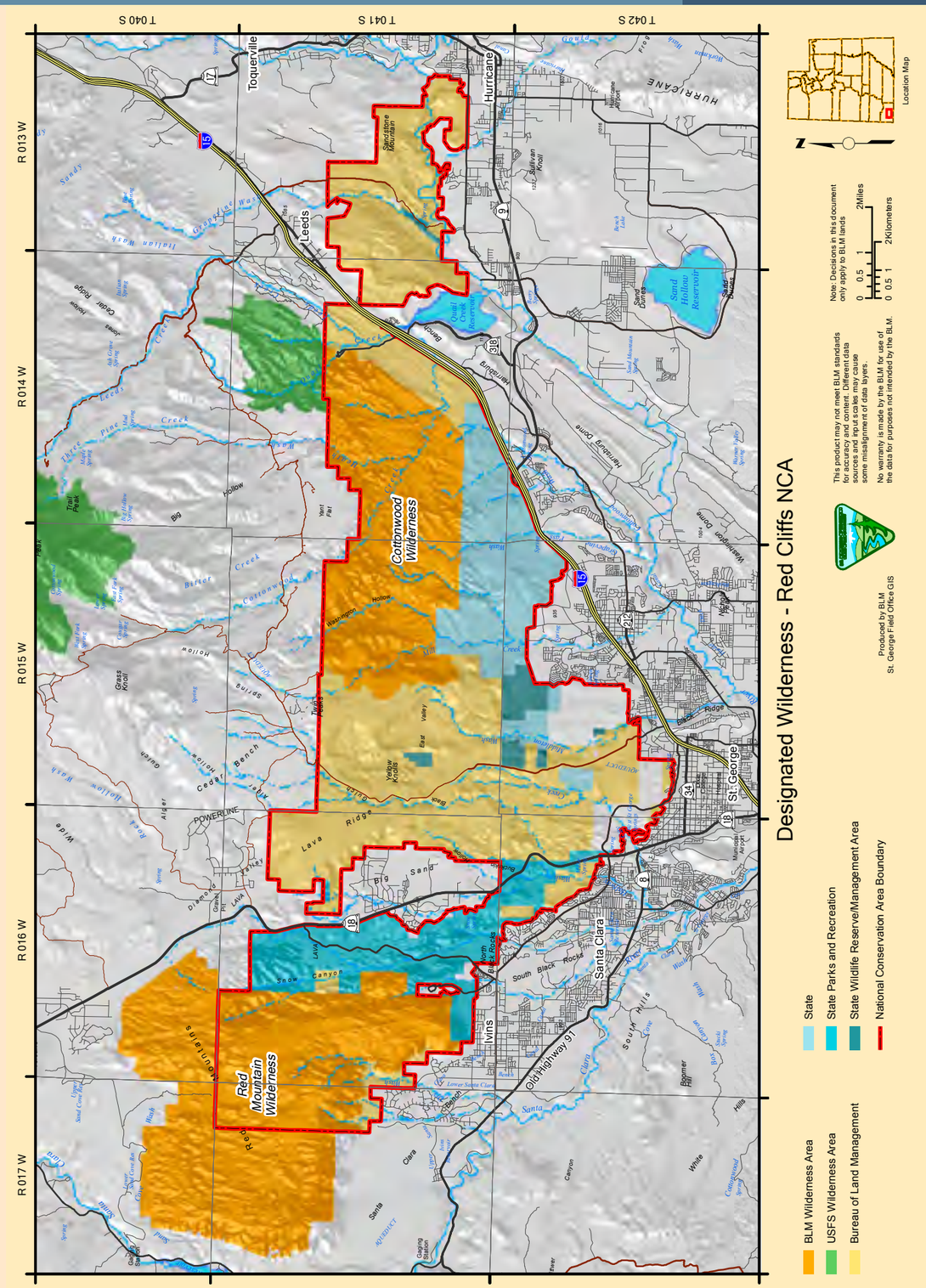
The Cottonwood Canyon and Red Mountain Wilderness areas were designated by Congress in 2009, through OPLMA (Map 3-46). Cottonwood Canyon includes approximately 11,668 acres of public land and is entirely within the boundary of Red Cliffs NCA. Red Mountain is 18,689 acres in size, with approximately 8,321 acres located within the NCA.

The geologic formation that is most evident in both wilderness areas is the Navajo Sandstone (Photo 3-144), which formed as Jurassic age sand dunes. The eroded dunes create an impressive landscape of canyons and ridges. Later volcanism is also evident in lava flows and cinder cones. The resulting landscape is both austere and intimate, affording outstanding opportunities for solitude and natural quiet.

Photo 3-144 Navajo Sandstone in Red Mountain Wilderness

Table 3-35 Wild and Scenic River Evaluation History for the Red Cliffs NCA

Segment	Description	Eligible	Suitable	Decision Source
City Creek	Small, ephemeral drainage directly north of St. George. A tributary of Halfway Wash	No	No	SGFO RMP
Cottonwood Creek	Ephemeral drainage that flows from Dixie NF through the Cottonwood Wilderness and into the Quail Creek	No	No	SGFO RMP
Grapevine Wash	Ephemeral drainage that flows from Dixie NF through the Babylon section of the NCA and into the Virgin River	No	No	SGFO RMP
Harrisburg Wash	Small ephemeral drainage in NW corner of the Babylon section of the NCA. Flows into Quail Creek	No	No	SGFO RMP
Leeds Creek	Ephemeral drainage that originates in the Pine Valley Mountains and flows into Quail Creek	No	No	SGFO RMP
Mill Creek	Ephemeral drainage that flows from Dixie NF through Washington City and into the Virgin River	No	No	SGFO RMP
Quail Creek	Ephemeral drainage that flows from Dixie NF through the Red Cliffs campground and into the Virgin River	No	No	SGFO RMP



"If future generations are to remember us with gratitude rather than contempt, we must leave them something more than the miracles of technology. We must leave them a glimpse of the world. As it was in the beginning, not just after we got through with it."

–Lyndon B. Johnson, 36th President of the United States, 1908–1973

Both the Red Mountain and Cottonwood Canyon Wilderness areas are popular destinations for hikers, climbers, and equestrians. No developed trails exist, but well-used primitive routes, made up primarily of washes and historic roads, are identified on maps, brochures, and guidebooks. Five established routes exist in the Cottonwood Canyon Wilderness and six in the Red Mountain Wilderness. All trailheads are located outside the wilderness boundaries and contain vault toilets, informational kiosks, gates with pedestrian/equestrian walkovers, and parking areas that can accommodate multiple vehicle/trailer combinations.

Access to Red Mountain Wilderness occurs through a variety of undeveloped access points and developed trailheads. Most equestrian users enter Red Mountain at BLM's Red Mountain Trailhead on State Route 18, while hikers use multiple points of entry.

Access to Cottonwood Canyon Wilderness is primarily through developed trailheads in the NCA. The most heavily used access is through Red Cliffs Recreation Area, a developed day use area and campground on the wilderness boundary. Cottonwood Canyon Wilderness shares part of its northern boundary with the Cottonwood Forest Wilderness on the Dixie National Forest.

3.36.3 Areas of Critical Environmental Concern

The Red Mountain ACEC was administratively designated in 1999, through a management decision in the SGFO RMP. The ACEC encompasses 4,840 acres of public land; while all of these are within the Red Mountain Wilderness (managed as a Wilderness Study Area prior to Congressional designation in 2009 through OPLMA); 3,294 acres of the ACEC are also within the NCA. The Red Mountain ACEC serves as a spectacular backdrop to the communities of Ivins and Santa Clara (Map 3-47).

The relevance and importance value of this ACEC was its outstanding scenic qualities. Special management attention was directed to the protection of those qualities through restrictions on surface disturbances, identified as management decisions in the 1999 St. George Field Office RMP.

3.37 VISUAL RESOURCE MANAGEMENT

The Red Cliffs NCA sits astride a transition zone between two major physiographic provinces, the Great Basin section of the Basin and Range Province and the Colorado Plateau. This results in a highly scenic area that, for most visitors, typifies the rugged and beautiful American Southwest. The colorful and diverse topography of these two provinces are reflected in the stunning visual impact of the NCA.

The NCA lands are located within the municipal boundaries of St. George, Hurricane, Santa Clara, Ivins, and Leeds. The greater St. George metropolitan area has been one of the fastest growing regions in the country for more than a decade and the scenic qualities of the NCA are among the reasons that many new residents elected to move the area. The natural character of the NCA landscape contrasts sharply with the highly modified human environment just outside its boundaries; the proximity of this stunning landscape is often used as a selling point by local realtors (Prudential Realty 2014; St. George Chamber of Commerce 2014; Snow Canyon Marketing 2014).

The landscapes of the east and south sides of the NCA are visible from I-15 beginning near Leeds and extending all the way through downtown St. George, a scenic 14 mile stretch. This landscape is one of dramatic contrasts, with jet-black basalt flows ending abruptly against deep red sandstone cliffs. The western boundary of the NCA encompasses Snow Canyon State Park and the Red Mountain

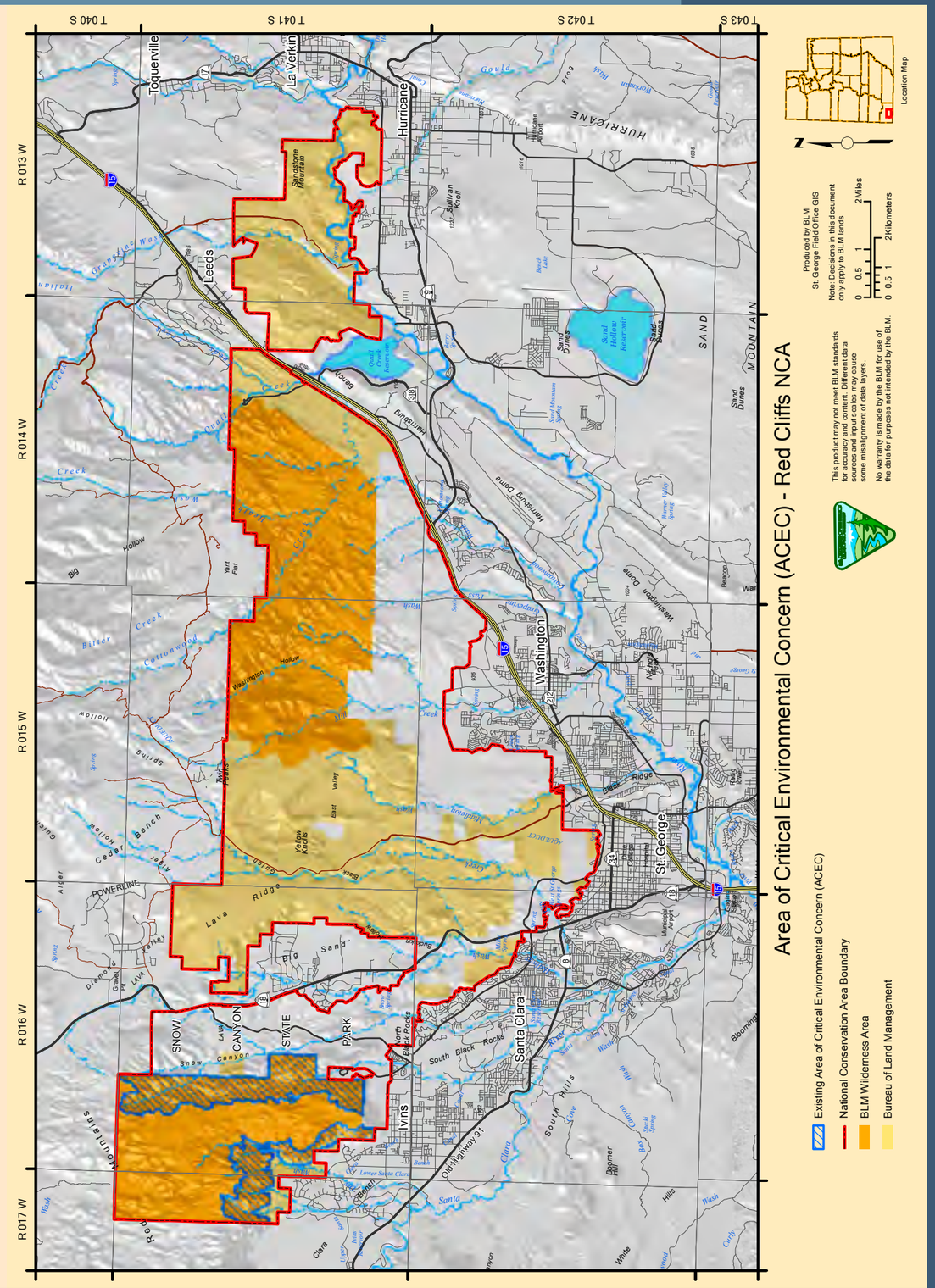


Photo 3-145 Power Substation on Cottonwood Road, Red Cliffs NCA

Wilderness. This viewshed may be the most remarkable in the entire NCA, as it is dominated by 1,800-foot high sandstone cliffs that loom over the cities of Ivins and Santa Clara.

The pristine quality of the visual resources in many portions of the NCA is reflective of its rugged and relatively undeveloped nature. There are, however, some areas of disturbance and development that can be found inside its boundaries. Cottonwood Road is one of the primary roadways through the heart of the NCA and is paralleled and crossed by power transmission lines; a substation (Photo 3-145) and other utility infrastructure are also visible from the roadway. These intrusions into the landscape give this area an industrial feel that seems strangely out of place in a generally natural and undeveloped landscape.

The reader is referred to the Affected Environment of Beaver Dam Wash NCA for information about BLM's Visual Resource Management System. Visual resources in the Red Cliffs NCA are currently managed according to the VRM classes prescribed through the 1999 SGFO RMP, as shown on Map 3-48. The VRM Management Classes within the NCA area are I, II, and III, based on inventory conducted for that planning effort. The existing acreage of each VRM Class within the Red Cliffs NCA is shown in Table 3-36. A VRI inventory was completed in 2010 and the results are also shown in Table 3-36 and on Map 3-49.

3.37.1 Natural Lightscapes

The reader is referred to the Affected Environment for Beaver Dam Wash NCA for a definition of Natural Lightscapes and how these are evaluated for management. Light pollution is visible from many locations within the NCA because of its proximity to the largest cities and most urbanized area of Washington County. Even within the deeper canyons of the Red Mountain and Cottonwood Wilderness areas, the municipal "glow" is clearly evident and much of the night sky is obscured. The cities of St. George, Hurricane, Ivins, Santa Clara, and Leeds all emit nighttime light that impacts the NCA.

Table 3-36 VRM and VRI Class Acreages

Management Class (VRM), Designated By SGFO RMP (1999)	Acres	Inventory Class (VRI), Results Of 2010 Visual Resource Inventory	Acres
Class I	19,989	Class I	20,766
Class II	0	Class II	8,971
Class III	24,870	Class III	14,977
Class IV	0	Class IV	145
Scenic Quality	Acres	Sensitivity	Acres
A	25,552	High	44,859
B	3,188	Medium	0
C	16,119	Low	0

"Silently, one by one, in the infinite meadows of heaven, blossomed the lovely stars, the forget-me-nots of the angels."
–Henry Wadsworth Longfellow, Poet, 1807-1882

3.38 NATURAL SOUNDSCAPES

The reader is referred to the Affected Environment for Beaver Dam Wash NCA for a definition of Natural Soundscapes and how these are evaluated for management. Because the eastern, southern, and western boundaries of the NCA abut the largest cities in Washington County, there are few areas where the sounds of vehicles traveling on city streets and major highways, as well as those sounds associated with residential developments and light industrial parks, are not audible to some extent. Natural soundscapes can be appreciated in the Red Mountain and Cottonwood Canyon Wilderness areas, where topographic features and distance from urban areas help to mute some of the noise pollution.

3.39 LANDS WITH WILDERNESS CHARACTERISTICS

The reader is referred to the Affected Environment at Section 3.17 for Beaver Dam Wash NCA for a discussion of the legal authority from FLMPA that directs BLM to maintain and update resource inventories, including those for public lands with wilderness characteristics, and to develop management actions through land use planning to protect those characteristics when they are determined to be present.

The NCA was inventoried for the presence or absence of wilderness characteristics in early 2012. The characteristics of wilderness: size, naturalness, outstanding opportunities of solitude, and outstanding opportunities for primitive and unconfined recreation, were evaluated during the inventory. The inventory found that wilderness characteristics were present in three areas totaling 1,586 acres, or 3% of the NCA (Map 3-50).

These acres possessed the characteristics of naturalness, solitude, and outstanding opportunities for primitive, unconfined recreation. They also met the criteria for size as they each encompass over 5,000 acres of contiguous BLM lands. The specific inventory criteria used can be found in *BLM Manual 6310* (.06, C, pp 4-10).

A summary of the inventory below and detailed results can be found in the *Lands With Wilderness Characteristics in Beaver Dam Wash National Conservation Area and Red Cliffs National Conservation Area Inventory* at www.blm.gov/nxld.

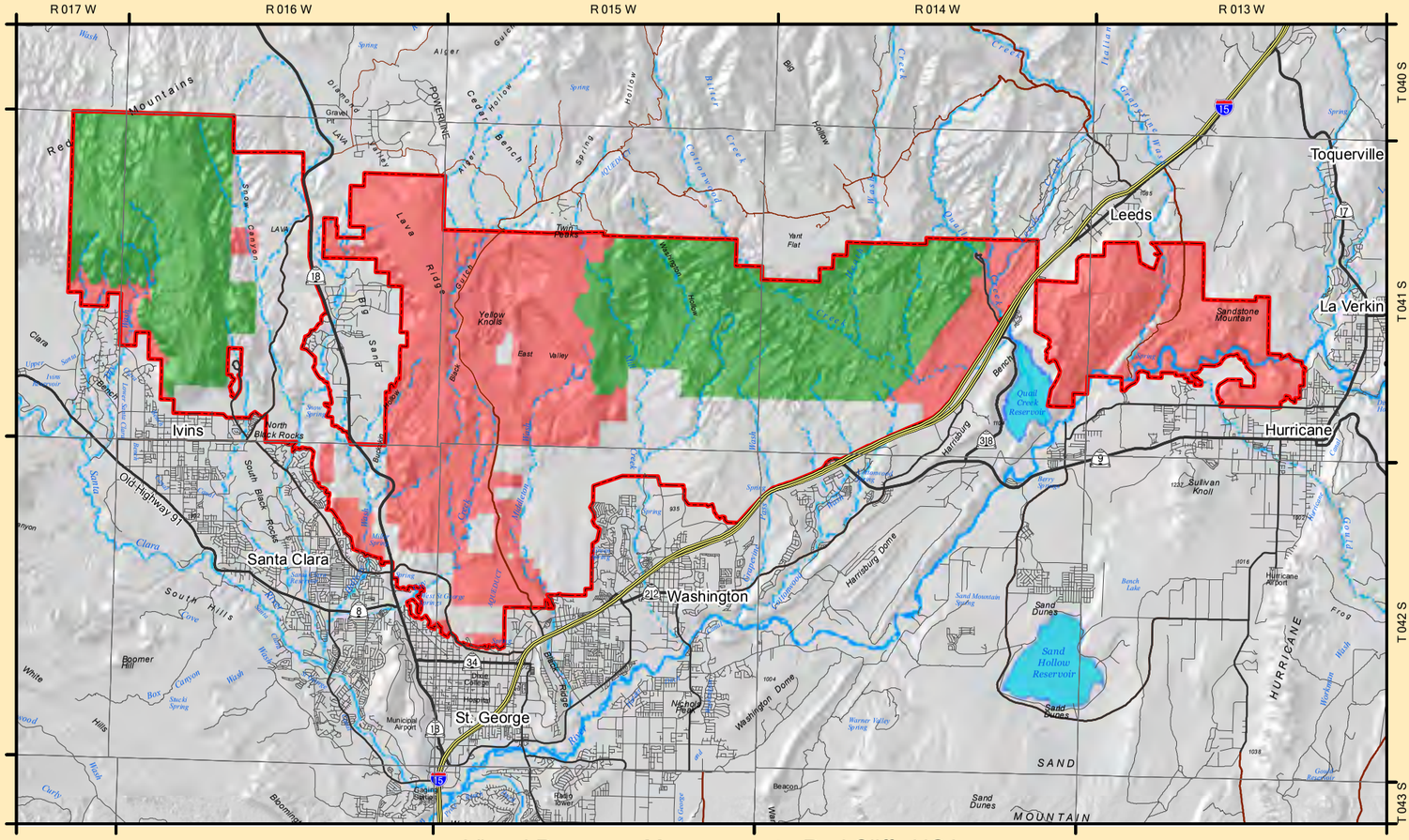
3.39.1 Red Mountain UT-040-132A

Inventory unit Red Mountain UT-040-132A is split into three geographically distinct sections located in central-western Washington County, just northwest of St. George. Only the two easternmost sections of 132A are within the boundaries of the NCA, contiguous with the Red Mountain Wilderness to the north and east. This analysis will only consider the wilderness characteristics of the portion of this unit within Red Cliffs NCA. The southern boundary of unit 132A abuts private land—the Kayenta residential subdivision located in Ivins, Utah. The western border of the unit adjoins the Shivwits Indian Reservation. The SGFO wilderness characteristics inventory determined that all 635 acres of unit 132A within the NCA possess wilderness characteristics.

Here, in the shadow of the towering 1,000-foot cliffs of Red Mountain Wilderness, sloping low-elevation foothills fan out, partitioned by dry arroyos with deep channels. Large sandstone boulders fringe the base of the cliffs. At an average elevation of 3,450 feet, the ground surface in the unit varies from compact dirt to cryptobiotic crust and stabilized sand dunes.

Straddling the border of the Mojave Desert and Great Basin Desert, unit 132A contains vegetation from both ecosystems, including a variety of shrubs such as mixed sagebrush, blackbrush, Mormon tea, and creosote, along with a variety of cacti, yucca, and agave (*Agave* spp.). Concentrations of juniper, ash (*Fraxinus* spp.), and cottonwood trees

"Every time I have some moment on a seashore, or in the mountains, or sometimes in a quiet forest, I think this is why the environment has to be preserved."
–Bill Bradley, Former United States Senator, 1943–



Visual Resource Management - Red Cliffs NCA

VRM Class

- Class I
- Class III
- National Conservation Area Boundary

Produced by BLM
St. George Field Office GIS

This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

Note: Decisions in this document only apply to BLM lands

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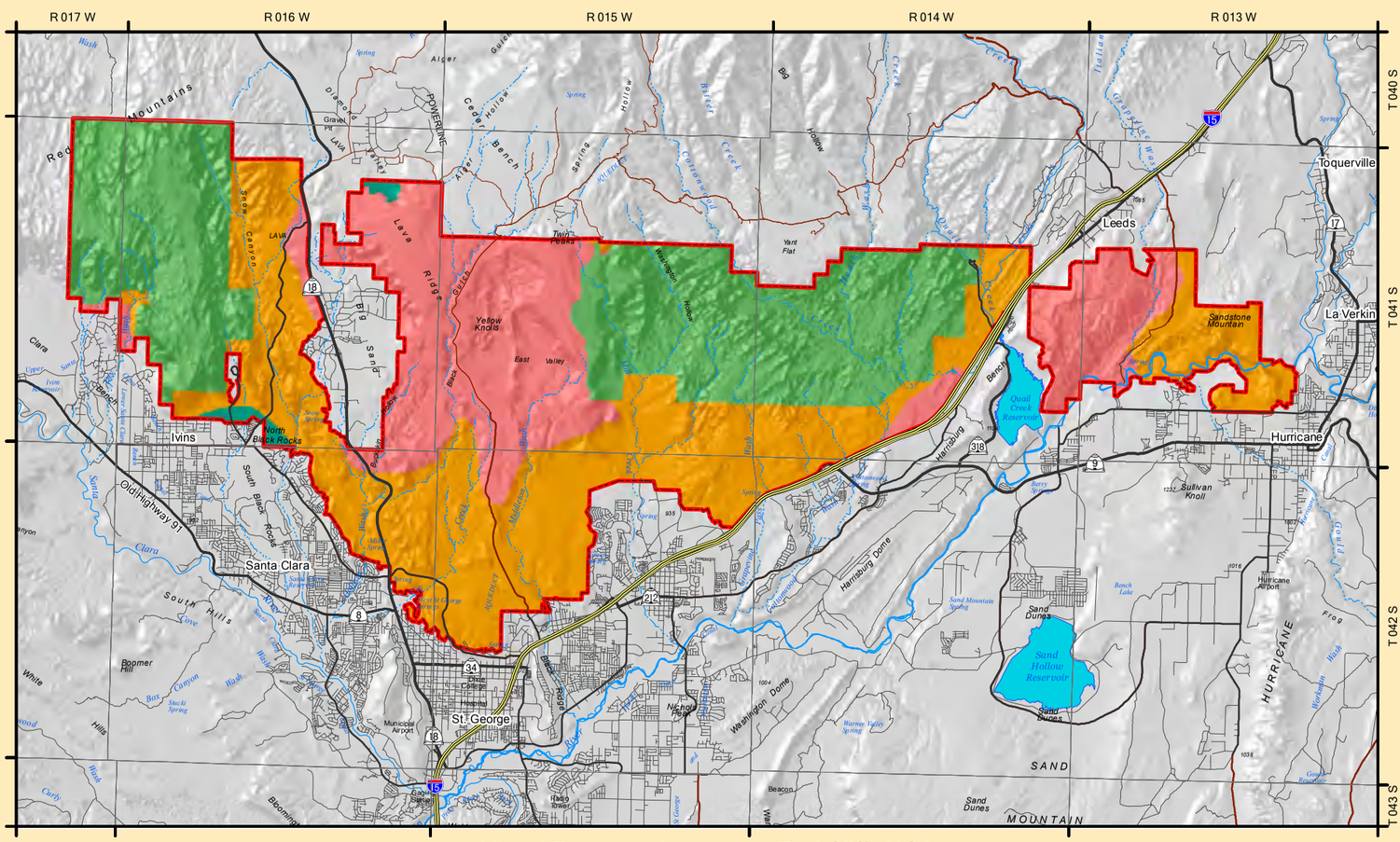

Visual Resource Inventory - Red Cliffs NCA

Visual Resource Inventory

- Class I
- Class II
- Class III
- Class IV

- National Conservation Area Boundary

Produced by BLM
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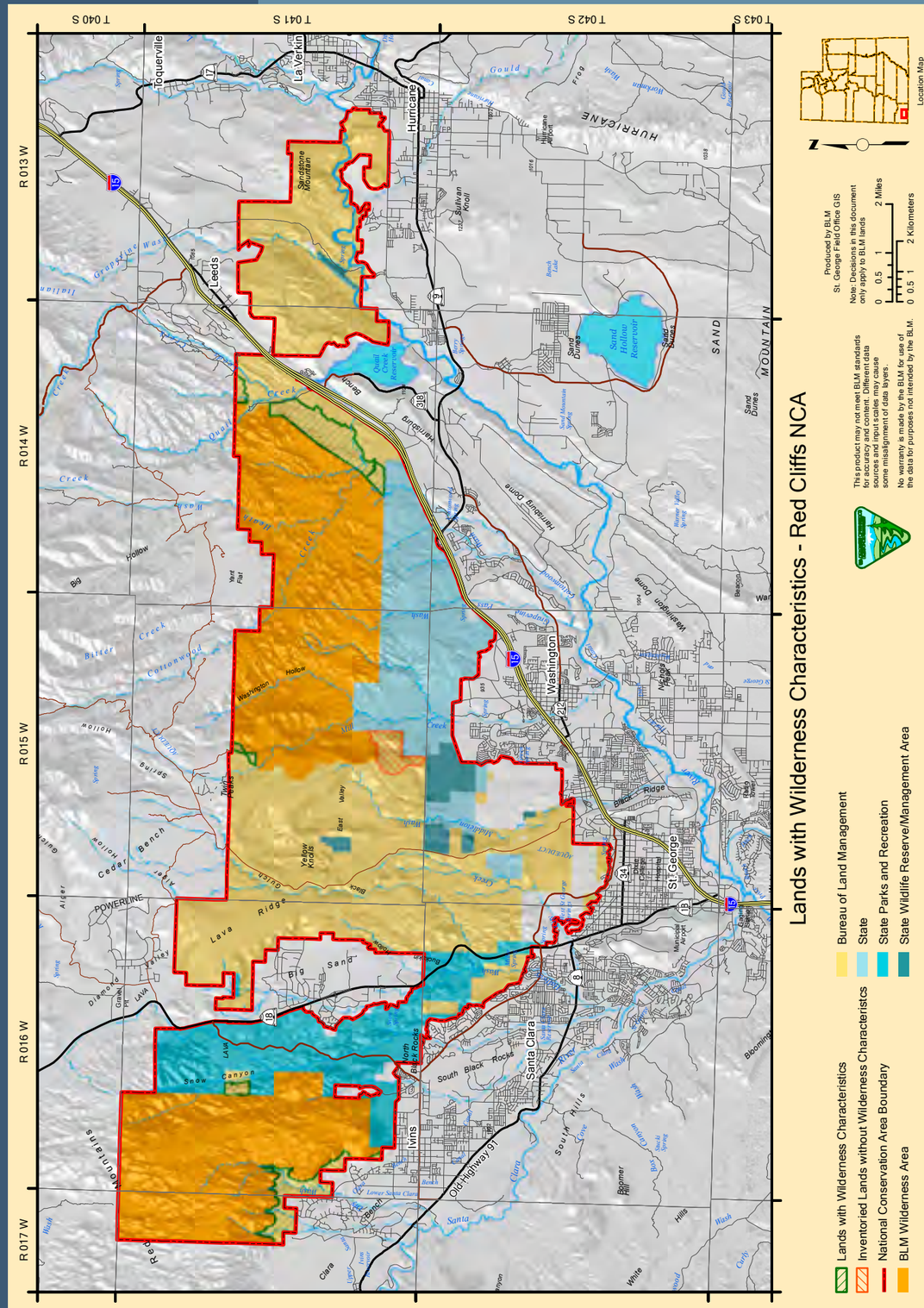


Photo 3-146 Red Mountain UT-040-132A Inventory Unit, Hellhole Canyon

are present in the northeastern portion of unit 132A, sustained by the riparian corridor of Dry Wash, which originates in Hellhole Canyon (Photo 3-146).

Section 132A is located entirely within an area of the NCA where non-motorized recreation is limited to existing trails. These off-trail restrictions, combined with the lack of noticeable human-made features, allow the area to retain its apparent naturalness to the average visitor, with recreational use primarily concentrated on the Hellhole Trail which follows the channel of Dry Wash.

Visitors may avoid the sights, sounds and evidence of other people easily in unit 132A. Numerous arroyos, elevation changes, rugged canyons, and ample vegetation all provide substantial topographic and vegetative screening, which allows outstanding opportunities for solitude. Although the Kayenta residential housing development lies just outside the inventory unit to the south, its impacts are negligible due to the low profile design and earth tone colors of the buildings that blend with the surrounding environment.

Although this area has few designated trails within it, opportunities for primitive and unconfined recreation abound. The area provides excellent opportunities for hiking, exploration, backpacking, photography, sightseeing, bird watching, and rock climbing. Intermittent streams and waterfalls flow after heavy rainfalls, while small potholes offer the opportunity for visitors to wade and swim in small pools near the mouth of Hellhole Canyon.

3.39.2 Red Mountain UT-040-132B

Red Mountain UT-040-132B is a small, 80-acre inventory unit. The unit is bounded on the north and south by Snow Canyon State Park. The eastern boundary of 132B is defined by West Canyon Road, while the western boundary is contiguous with Red Mountain Wilderness. This inventory unit is mostly comprised of 400-foot cliffs of red Navajo Sandstone, rocky hidden canyons, and outcroppings of colorful red and white slickrock (Photo 3-147). In many areas, the rock is cross-bedded, having been weathered in patterns that resemble a checkerboard. All land inventoried within unit 132B possesses wilderness characteristics.

Vegetation of the unit includes mixed sagebrush, yuccas, low shrubs, small cacti, and bitterbrush. Concentrations

"When you have seen one ant, one bird, one tree, you have not seen them all."
–E. O. Wilson, Biologist, Researcher, Theorist, Naturalist, and Author, 1929–

"The rugged landscape of the Red Mountain unit combined with thick vegetation, offers substantial topographic and vegetative screening, allowing outstanding opportunities for solitude."

of Utah Juniper and single-leaf ash (*Fraxinus anomala*) are present in drainages and riparian corridors.

Overall, the landscape of unit 132B appears to have been affected primarily by the forces of nature. The area appears natural to the average visitor with signs of human impacts being substantially unnoticeable. Few social trails and the prevalence of slickrock (or rather, the relative absence of track-holding soils) contribute to the area's apparent naturalness.

Although West Canyon Road and a small building are found just outside the unit to the east, their presence cannot be considered a significant impact to the perceived naturalness of the unit. Because access is limited to authorized vehicles, West Canyon Road does not receive regular and continuous use from motorized vehicles. Therefore, there is little to no vehicular noise or other noticeable, pervasive anthropogenic influences associated with the road or the structure.

The rugged landscape of unit 132B—high cliffs, deep canyons, and dramatic changes in elevation—combined with thick vegetation, offers substantial topographic and vegetative screening, allowing outstanding opportunities for solitude in that recreationalists may easily avoid the sights, sounds, and evidence of other people.

Section 132B is located entirely within the Upland Zone of the NCA where non-motorized recreation is permitted off-trail. Although this area has no designated trails within it, a multitude of outstanding opportunities for primitive and unconfined recreation exist. These include hiking, exploring, backpacking, photography, bird watching, and sightseeing. The Navajo Sandstone cliffs in nearby Snow Canyon State Park are very popular among rock climbers. Similarly, there are a number of areas inside 132B that would provide outstanding opportunities for rock climbing.

3.39.3 Cottonwood Canyon UT-040-046A

UT-040-046A is a sub-section of the Cottonwood Canyon UT-040-046 inventory unit within the NCA. Sub-section 046A is bounded on the south and east by the Prospector trail, and by the access road to Red Cliffs Recreation Area on the northernmost portion of its eastern boundary. The southernmost boundary occurs where the parcel meets state lands, and the entire northwestern border adjoins the Cottonwood Canyon Wilderness. Trails within the boundary include parts of the Cottonwood Canyon trail, the Red Reef trail, and the Cottonwood Hills trail, all in the southernmost portion of the parcel. I-15 runs parallel to the eastern boundary of this parcel, less than a mile away. A cherry-stemmed road along the Cottonwood Hills trail is located near the southern edge of the unit. All land inventoried within unit 046A possesses wilderness characteristics.

The landscape consists of low-elevation, rolling foothills at the base of steeper Navajo Sandstone cliffs to the west (Photo 3-148). Outcroppings and

Photo 3-147 Red Mountain UT-040-132B Inventory Unit

boulders of sandstone and basalt are present in many areas.

The vegetation is characteristic of the Mojave Desert and the Great Basin, including sagebrush, small shrubs, creosote bush, agave, yuccas, small cacti, juniper, and some small ash trees in riparian areas.

The unit appears natural to the average visitor with signs of human impacts being substantially unnoticeable. Primary human activities are recreational and include hiking, mountain biking and horseback riding. All three of these activities occur on the Prospector trail (which forms the eastern boundary of Section 046A), while hiking and equestrian use occurs on the Red Reef, Cottonwood Canyon, and Cottonwood Cliffs trails, all leading into the Cottonwood Canyon Wilderness. Old fence lines exist as substantially unnoticeable reminders of past livestock grazing.

This unit offers outstanding opportunities for solitude in that people may avoid the sights, sounds and evidence of other people because the landscape allows for topographic and vegetative screening. From the easternmost sections of this parcel, the sights and sounds of traffic on I-15 are pervasive and omnipresent, lessening outstanding opportunities for solitude in this portion of the unit.

The unit offers outstanding opportunities for primitive and unconfined recreation. Section 046A is located within the Lowland Zone of the NCA where non-motorized recreation is limited to existing trails. Recreational use is primarily concentrated on designated trails in the southern portion of the unit. It is also a popular destination for horseback riding, hiking, trail running, off-trail exploration, backpacking, photography, and sightseeing for botanical, zoological, and geologic features. Additionally, the sandstone cliffs and boulders provide great opportunities for rock climbing and bouldering.

3.39.4 Cottonwood Canyon UT-040-046C

UT-040-046C is a sub-section of the original Cottonwood Canyon 046 inventory unit and is located in central eastern Washington County within Red Cliffs NCA, just northeast of St. George. It is bounded on the north by the Dixie National Forest. The parcel is contiguous with the Cottonwood Canyon Wilderness along its eastern and southern boundaries. The Ice House trail forms the western boundary of the

Photo 3-148 Cottonwood Canyon UT-040-046A Inventory Unit

"If you foolishly ignore beauty, you'll soon find yourself without it…all the days of your life…."
–Frank Lloyd Wright, Architect, 1867–1959

inventory unit and Forest Service Road #902 provides motorized access to the northern border of this parcel. All land inventoried within unit 046C possesses wilderness characteristics.

Most of the inventory unit 046C is located on a high, gently-sloping plateau in the foothills of the Pine Valley Mountains. It is surrounded by the deep canyons and the rugged sandstone topography of Cottonwood Canyon Wilderness to the east. The northern portion of the unit includes a drainage, whose streambed delineates the unit's boundary with the Cottonwood Canyon Wilderness.

Patches of pinyon-juniper forest dot the landscape, with small shrubs growing as understory. Much of this unit has been damaged by wildfire, which is apparent from the many charred juniper snags in the vicinity (Photo 3-149).

The area appears natural to the average visitor with signs of human impacts being substantially unnoticeable. Primary human activities are recreational and include hiking and horseback riding. Both of these activities occur on the Ice House trail. An access road to the Dixie National Forest is a substantially unnoticeable feature of previous human use in the area, as it has been closed to motorized use since the creation of the Reserve in 1996.

The unit's vegetation—sparse, short, and charred—provides little to no vegetative screening. The relatively flat relief that spans more than one-half of the unit offers little topographic cover. These factors, combined with the small size of the unit would not prevent visitors from seeing and hearing other people in the area. Outstanding opportunities for solitude do not exist in unit 046C.

Despite the lack of designated trails here, outstanding opportunities for primitive and unconfined recreation abound. Primitive recreational activities may be enjoyed throughout this area where off-trail recreation is permitted. Such activities include hiking, horseback riding, exploration, backpacking, photography, sightseeing, bird watching, rock climbing, and hunting. Large populations of mule deer are found in the area, making this a good place for hunting.

3.39.5 Cottonwood Canyon UT-040-046D

Inventory unit UT-040-046D is a subsection of the Cottonwood Canyon UT-040-046 inventory unit. This 158 acre area of BLM-managed land is situated along the southeast border of Cottonwood Canyon Wilderness and its southern portion lies within the Red Cliffs NCA. Unit 046D is bounded on the north by the Dixie National Forest and is contiguous with the Cottonwood Canyon Wilderness along its western boundary. This analysis will only consider the wilderness characteristics of the small, 70-acre portion of the southern section of this unit within the NCA.

The landscape here consists of low-elevation, rolling foothills at the base of steeper sandstone cliffs that form the boundary of Cottonwood Canyon Wilderness (Photo 3-150). This area, ranging from approximately 3,200-3,400 feet in elevation, encompasses the entrance to Dicks Canyon, a drainage northeast of Quail Creek that descends from the Pine Valley Mountains. The sandy wash winding into Dicks Canyon receives recreational use from hikers and equestrians.

Predominant vegetation includes sagebrush, small shrubs, creosote bush, juniper, agave, yuccas, small cacti, cottonwood, and small ash trees in riparian areas.

Here, people may easily avoid the sights, sounds, and evidence of others due to a substantial amount of topographic and vegetative screening. Low-lying drainages, steep cliffs, and scattered patches of vegetation offer outstanding opportunities for solitude. Silver Reef, a long section of uplifted white Navajo Sandstone which runs parallel to the eastern boundary of unit 046D, forms an abrupt topographic boundary, which buffers noise and visual impacts from I-15, making the area even more conducive to experiencing solitude. Because these activities are mainly concentrated on the Red Reef East trail (which forms the southern boundary of the unit), and no other obvious signs of human impacts are present, the area appears natural to the average visitor.

The offers outstanding opportunities for primitive and unconfined recreation. Current recreational uses of the unit include hiking, horseback riding, exploration, backpacking, photography, and sightseeing. Additionally, the sandstone cliffs and boulders provide opportunities for rock climbing and bouldering.

"Much of Cottonwood Canyon sub-section 046C has been damaged by wildfire, which is apparent from the many charred juniper snags in the vicinity."

Photo 3-149 Cottonwood Canyon UT-040-046C Inventory Unit

Photo 3-150 Cottonwood Canyon UT-040-046D Inventory Unit

"Now I see the secret of making the best persons, it is to grow in the open air and to eat and sleep with the earth."

–Walt Whitman, Poet, 1819-1892

"Life is best enjoyed when time periods are evenly divided between labor, sleep, and recreation…all people should spend one-third of their time in recreation which is rebuilding, voluntary activity, never idleness."

–Brigham Young, 2nd President of The Church of Jesus Christ of Latter Day Saints, 1801-1877

3.40 RECREATION AND VISITOR SERVICES

3.40.1 Recreation

Recreational opportunities are locally well known, as the Reserve has been in place for 18 years and Washington County residents have grown accustomed to the easily-accessible trails and trailheads. While the NCA does attract visitors from outside the region, the majority of the recreational use is by local residents. The major attraction is a system of hiking, biking, and equestrian trails, all set in a stunning backdrop of red and white sandstone cliffs and jet-black basalt flows. Much of the trail system lies within the municipal boundaries of St. George, Hurricane, Santa Clara, Ivins, and Leeds; housing developments have been constructed along the NCA boundaries (Photo 3-151) and homeowners and other local residents value the NCA for its high quality open space.

3.40.1.1 Special Recreation Management Areas

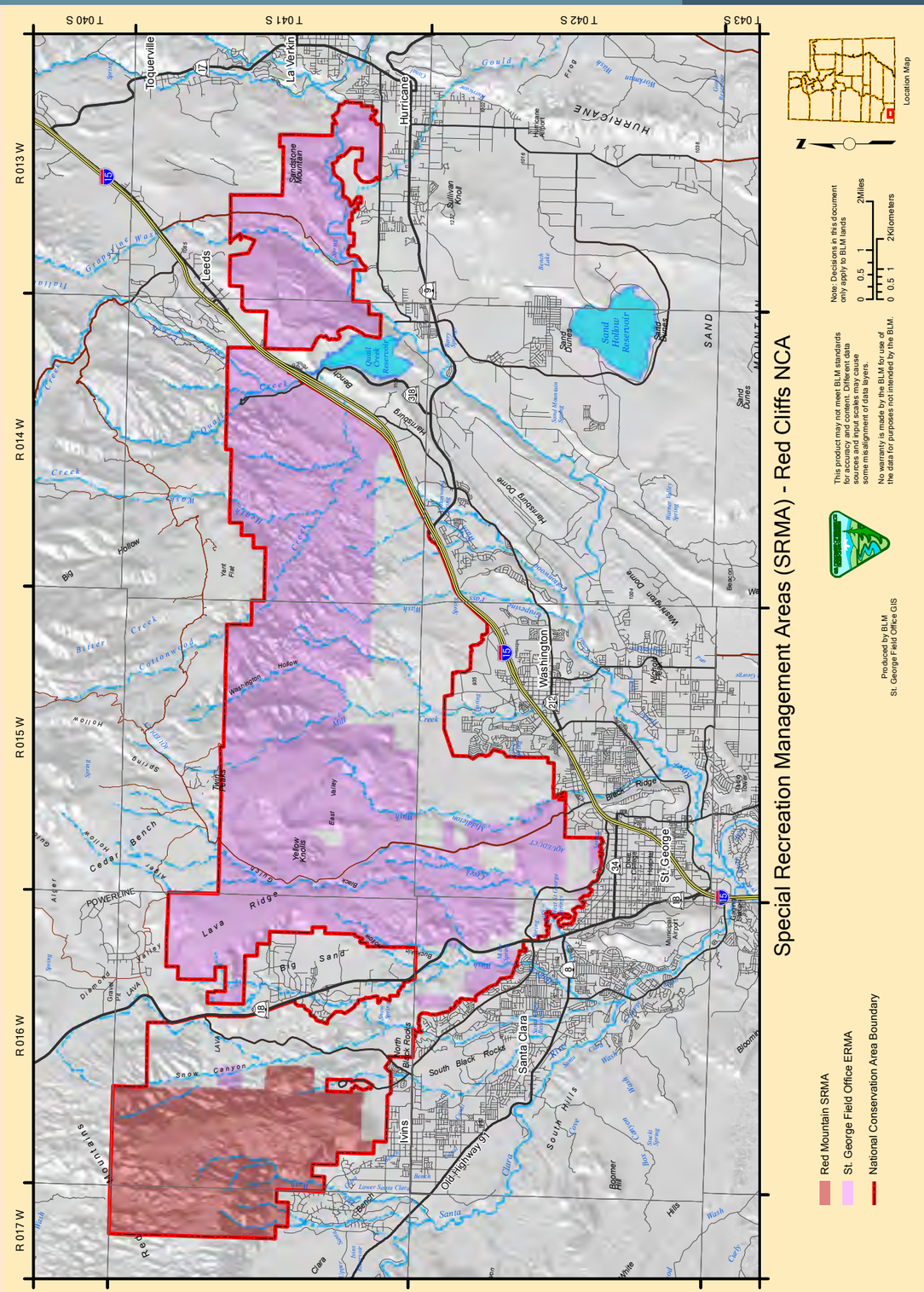
The 1999 SGFO RMP identified two special recreation management areas that overlap today's NCA, as shown on Map 3-51. A majority of the acreage of the NCA is included in the SGFO ERMA, where recreation management was only one of several management programs that would be applied to the public lands. While most recreational uses in ERMAs are dispersed and unstructured, developed facilities, like the Red Cliffs Recreation Area, may be included. Management emphasis for the SGFO ERMA is protection of resource values and the development or maintenance of trails and other sites of recreational interest.

The NCA is also within the 23,725 acre Red Mountain/Santa Clara SRMA. Management direction for the SRMA includes the improvement and maintenance of a trailhead and hiking trail on Red Mountain, and limits on group sizes, the number of pack animals per trip, and the number of commercial use permits that would be issued for Red Mountain. Management of recreation activities within the portion of the SRMA that overlaps the Reserve complies with the goals of Washington County's HCP.

Management Zones

The 1999 SGFO RMP included management decisions that would protect tortoise habitat and populations on the public lands that were included in the mitigation reserve for Washington County's HCP. The RMP identified that an implementation-level plan would be prepared to provide specific management direction for recreation and other public

Photo 3-151 Urban Development in St. George on Boundary of Red Cliffs NCA



"A mind that is stretched by a new experience can never go back to its old dimensions."
–Oliver Wendell Holmes, American Poet, 1809-1894

uses of the reserve lands, as these were only generally addressed in the HCP.

That implementation-level plan, the *Red Cliffs Desert Reserve Public Use Plan* (PUP) (2001), was completed through the efforts of a multi-disciplinary team in 2000; BLM prepared an EA and Decision Record in 2001, authorizing implementation of the PUP on public lands. The prescriptions and decisions from the PUP direct the current recreation management for the public lands of today's Red Cliffs NCA and are summarized below.

Two zones, Upland and Lowland, were designated in the PUP in an effort to protect the most biologically and ecologically sensitive areas of the Reserve. The zones are shown on Map 3-52. The Upland Zone was considered to provide less quality habitat for desert tortoises and support fewer tortoises when compared to the Lowland Zone. Based on these distinctions, in the Upland Zone, hikers and equestrians were permitted to travel off-trail (Photo 3-152), but mountain bikers were restricted to designated trails. Camping and campfires were allowed with some limitations. All recreational use in the Lowland Zone was restricted to designated trails, while camping and campfires were only allowed in designated campgrounds.

Recreational users have long expressed confusion about this zoning. The Upland/Lowland boundary does not predictably follow an elevation or topographic contour line, deviating by as much as a 1,000 vertical feet in some locations. It is difficult for most recreation users to determine why some areas at the same elevation and in the same vegetation communities are characterized as "upland" and others as "lowland." In the Red Mountain and Cottonwood Canyon Wilderness areas, the zone boundary crosses in and out of wilderness multiple times. Being restricted to designated trails inside wilderness areas is a common public complaint, as it conflicts with one of the fundamental concepts of wilderness, the opportunity to enjoy primitive, unconfined recreation.

Photo 3-152 Hiking Off-trail in Upland Zone, Red Cliffs NCA

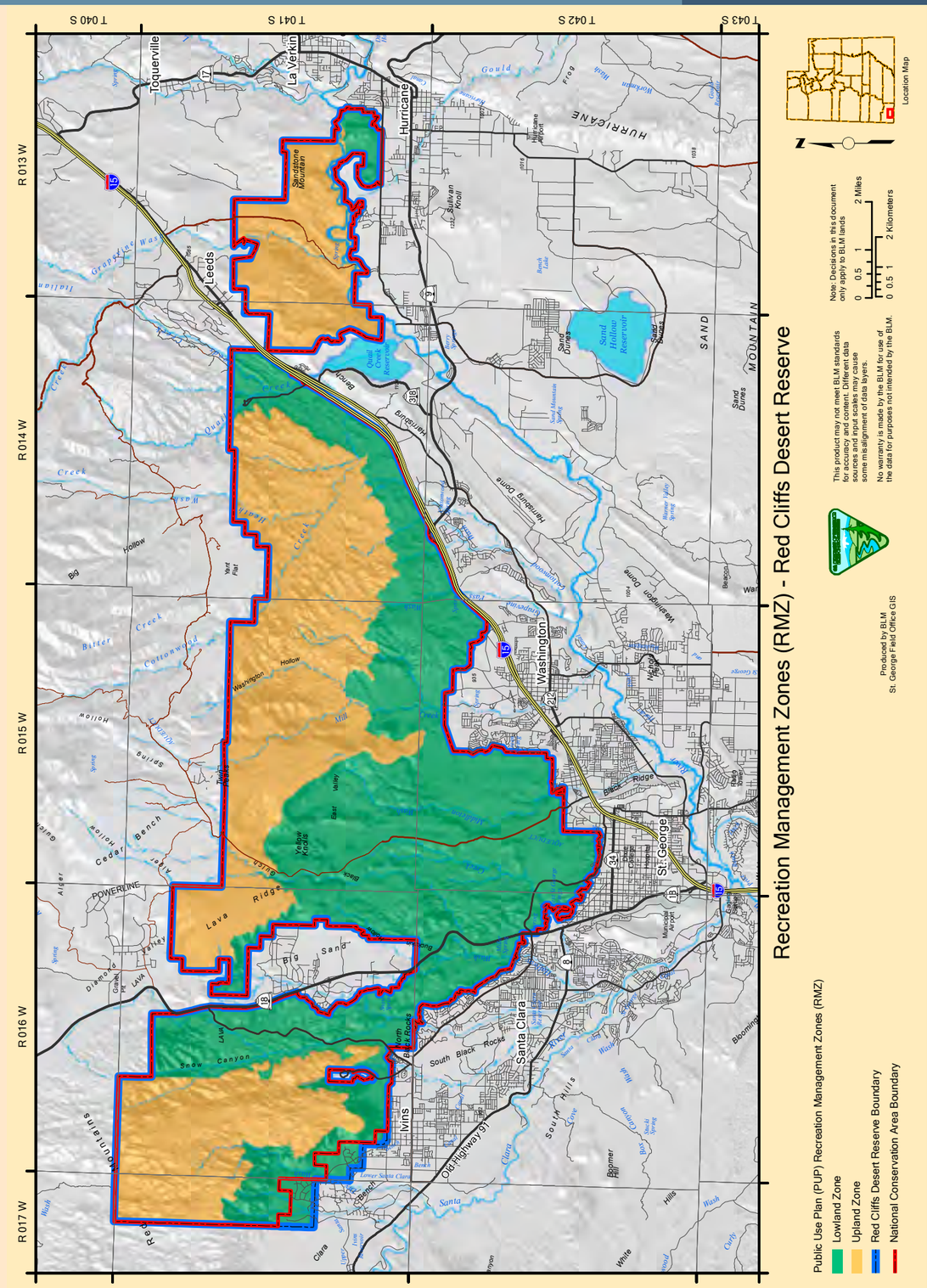


Photo 3-153 Hiking Arch Trail, Red Cliffs NCA

Photo 3-154 Mountain Biking Prospector Trail, Red Cliffs NCA

3.40.1.2 Recreation Uses

Hiking

One of the most popular ways visitors experience the NCA is hiking on one of the 81 trails and routes (Photo 3-153), 68 of which are managed in whole or in part by the BLM (Map 3-53). Many of the trails are open to all non-motorized users, including hikers, mountain bikers, and equestrians, but 10 are available only to hikers. In the Lowland Zone, hikers are restricted to designated trails. In the Upland Zone, off-trail travel is permitted.

Mountain Biking

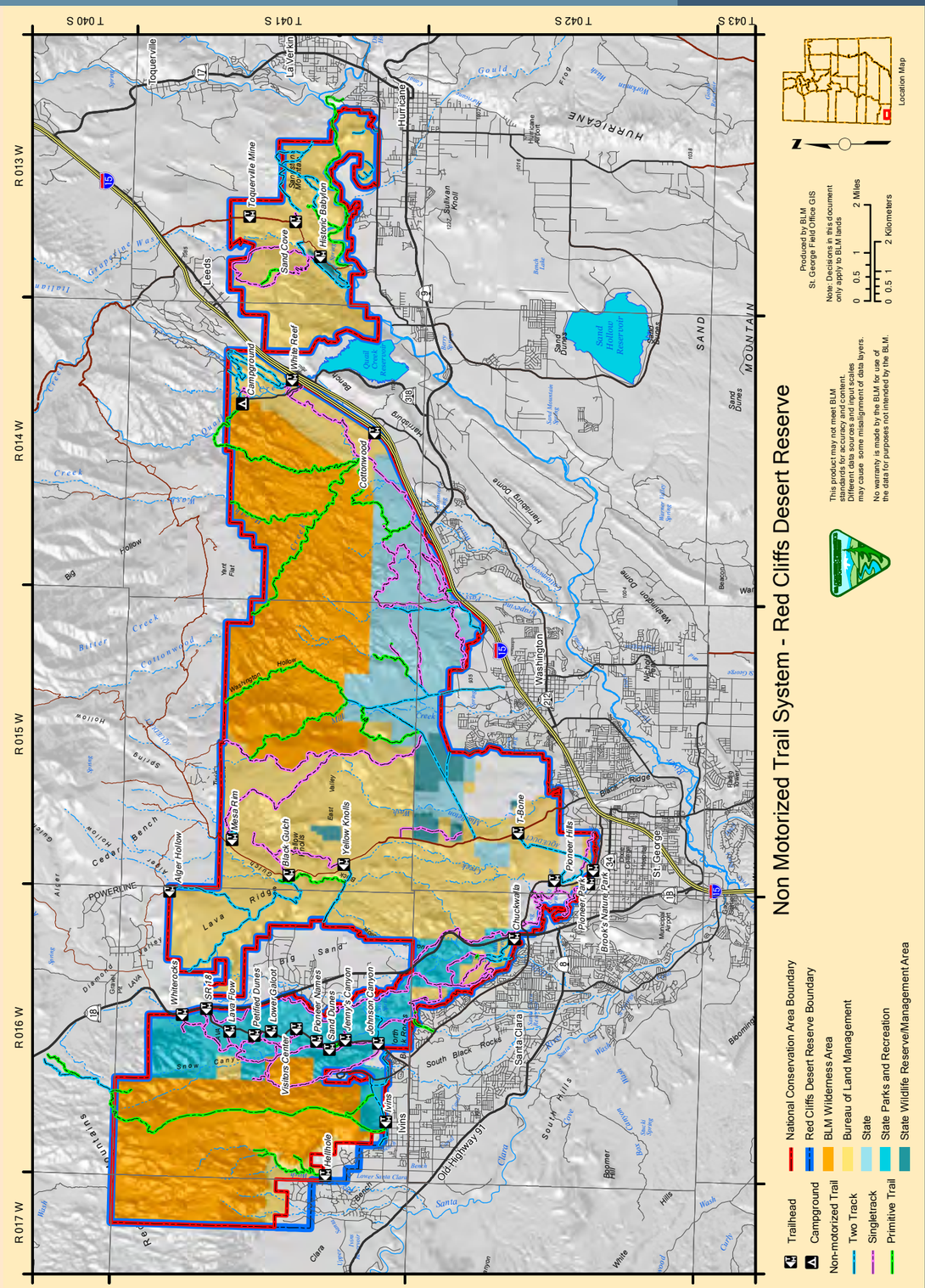
Mountain bikes are restricted to designated trails in both the Upland and Lowland Zones and are prohibited in both designated wilderness areas. Mountain biking opportunities range from smooth and easy out-and-back cruises suitable for a wide range of abilities, to experts-only technical slickrock rides (Photo 3-154). Off-road cycling in the NCA is the third most popular activity after hiking and rock climbing (University of Idaho 2011), although its appeal is waning. This decline is due to the construction of mountain-bike specific trails elsewhere on public lands managed by the SGFO. These new trails offer a user experience that cannot be found in the NCA, where many of the "trails" are former two-track roads.

Equestrian Use

Most pack stock trail riding occurs during the spring and fall months, although some equestrians take early morning rides even during the heat of the summer. Riding opportunities in the NCA are abundant, ranging from short, easy jaunts to long, demanding, backcountry trail rides (Photo 3-155). Horses are restricted to designated trails in the Lowland Zone, but off-trail travel is permitted in the Upland Zone. Riding is most popular in the urban interface areas of Paradise Canyon, Red Mountain, Cottonwood, and Grapevine. The popularity of certain areas may be a reflection of those locations where adequate parking facilities for horse trailers are available. In 2010, BLM constructed new equestrian trailheads at Red Mountain and White Reef; a new non-motorized trail system was developed in the White Reef area that afforded connections to other long-distance trail networks in the NCA that are enjoyed by equestrians. These new facilities have increased equestrian use substantially in both areas. Despite the increase in use, equestrians remain the smallest user group of the NCA.

Photo 3-155 Equestrians in Red Cliffs NCA

"No hour of life is lost that is spent in the saddle."
–Winston Churchill, Former Prime Minister of the United Kingdom, 1874 – 1965



"A climber's day always starts at the crux: getting out of bed."
–Anonymous

Rock Climbing, Rappelling, and Scrambling

Climbing is the second most popular activity in the NCA, after hiking. Within the NCA boundary are four areas where authorized rock climbing and rappelling activities occur: Snow Canyon State Park, West Canyon, Paradise Canyon, and Pioneer Park (managed by the City of St. George). Climbing and rappelling outside of these designated areas is prohibited by the PUP.

Only two of the climbing sites in Paradise Canyon are on public lands and managed by BLM; both are accessed from well-established staging areas along State Route 18. Chuckwalla is located just west of State Route 18 at milepost 3. It is the most easily accessible climbing area and provides sandstone routes ranging in difficulty from 5.10 to 5.12 (Photo 3-156). The climbing wall itself is on the boundary between Snow Canyon State Park and BLM-managed lands of the NCA.

Turtle Wall is located northwest of Chuckwalla in the bottom of Paradise Canyon and is located on public lands managed by BLM. The wall, which faces east, offers the most technical routes established in Paradise Canyon. Turtle Wall is accessed from the same staging area as Chuckwalla and can be found by following the well-established trail along the canyon floor.

West Canyon is a small climbing site on the east side of Red Mountain Wilderness. Access to the site is through Snow Canyon State Park. Of the five climbs located here, three are on BLM-managed lands. Climbs range from 5.8 to 5.11 and are reached from the Three Ponds trail off West Canyon Road within the State Park. Snow Canyon State Park manages this site under its Climbing Management Plan.

Less technical than rock climbing or rappelling is the popular activity known as "rock scrambling." Typically, this entails moving over rocky terrain using one's hands and feet and without using any protective equipment. Scrambling around on steep, rocky terrain is a popular activity in the NCA, and one that is difficult to control. Easily accessible slickrock, directly adjacent to designated hiking trails, is an attraction that many find difficult to resist. However, because tortoise burrows are often found under and around rocky ledges, rock scrambling is allowed only in the Upland Zone.

Camping

Camping in the Lowland Zone is restricted to the developed campground in the Red Cliffs Recreation Area. Campfires are restricted to established fire rings within the campground and firewood gathering is prohibited.

Dispersed camping is allowed within the Upland Zone, except in the Sandstone Mountain area where camping is restricted to the Sand Cove Primitive Camping Area (Photo 3-157). Camping at this popular site requires a no-fee permit issued by the BLM.

Sand Cove is a small, undeveloped camping area on public lands that has a long history of use by organized groups. This is the only location in the NCA outside of the developed Red Cliffs Recreation Area campground where vehicle camping is currently allowed. While the area can and does handle a large amount of day use traffic, there are no restrooms and no designated parking or campsites. Day users must walk through the camping area to access nearby trails. The road into the area is unimproved and can pose risks to motorists, as even minor flood events can scour the wash that must be crossed in order to access the site. Groups who reserve the site are required to haul out all garbage and human waste.

Photo 3-156 Climbing Chuckwalla in Red Cliffs NCA

Campfires are allowed in the Upland Zone, but are subject to periodic closures during times of high fire danger.

Hunting

Hunting is allowed in the Upland Zone, and within the Lowland Zone on the east side of Cottonwood Road; it is the only off-trail use allowed in the Lowland Zone. The PUP prohibits hunting on the west side of Cottonwood Road.

Target Shooting and Discharge of Firearms

Target shooting and the discharge of firearms, except in the pursuit of game animals by individuals holding valid hunting licenses during prescribed hunting seasons, is prohibited in the Reserve and today's NCA, pursuant to the municipal ordinances listed below and a Washington County ordinance that applied to all areas outside of the annexation boundaries of the municipalities. The 1999 SGFO RMP included a management decision (LD-03, page 2.2) that authorized the management of public lands in accordance with applicable city and county zoning restrictions and municipal ordinances, to the extent that such restrictions and ordinances are consistent with federal laws, regulations, and policies, and approved decisions of the RMP.

- City of St. George: No discharge of firearms within the Reserve inside city limits, except by licensed hunters in the act of hunting during prescribed seasons.
- City of Hurricane: No discharge of firearms within the Reserve inside city limits, except by licensed hunters in act of hunting during prescribed seasons.
- City of Ivins: No discharge of firearms within city limits.
- Washington City: No discharge of firearms within the Reserve inside city limits, unless expressly proclaimed for that year by the Mayor that hunting is allowed, and only by

Photo 3-157 Sand Cove Primitive Camping Area, Red Cliffs NCA

"What happens around the campfire, stays at the campfire."
–Anonymous

licensed hunters in the act of hunting during proclaimed seasons.

Geocaching

The cache itself is typically a small waterproof box. The global website for geocaching is www.geocaching.com (Geocaching.com 2014). A zip code entered into this website produces a list of all the cache sites in that area. Each cache site listed includes latitude/longitude, a narrative description, and the contents of the cache.

The PUP prohibits geocaching in the Lowland Zone, but may allow it in the Upland Zone depending on the placement of the cache. Geocaching is regulated by national BLM policy and the PUP. All geocaches proposed to be located within the boundaries of the Reserve must have written approval from Washington County's HCP Administrator prior to placement on federal and non-federal lands. Geocaches placed without written approval are removed immediately.

The placement of geocaches raises concerns for impacts to habitat caused by visitors traveling off trail and the development of "geo trails." It is unclear how effective the existing policy has been. The locations of 70 geocaches have been identified, 50 of which were in the Lowland Zone, and 38 of those were in critical tortoise habitat (Geocaching.com 2014).

"The placement of geocaches raises concerns for impacts to habitat caused by visitors traveling off trail and the development of geo trails."

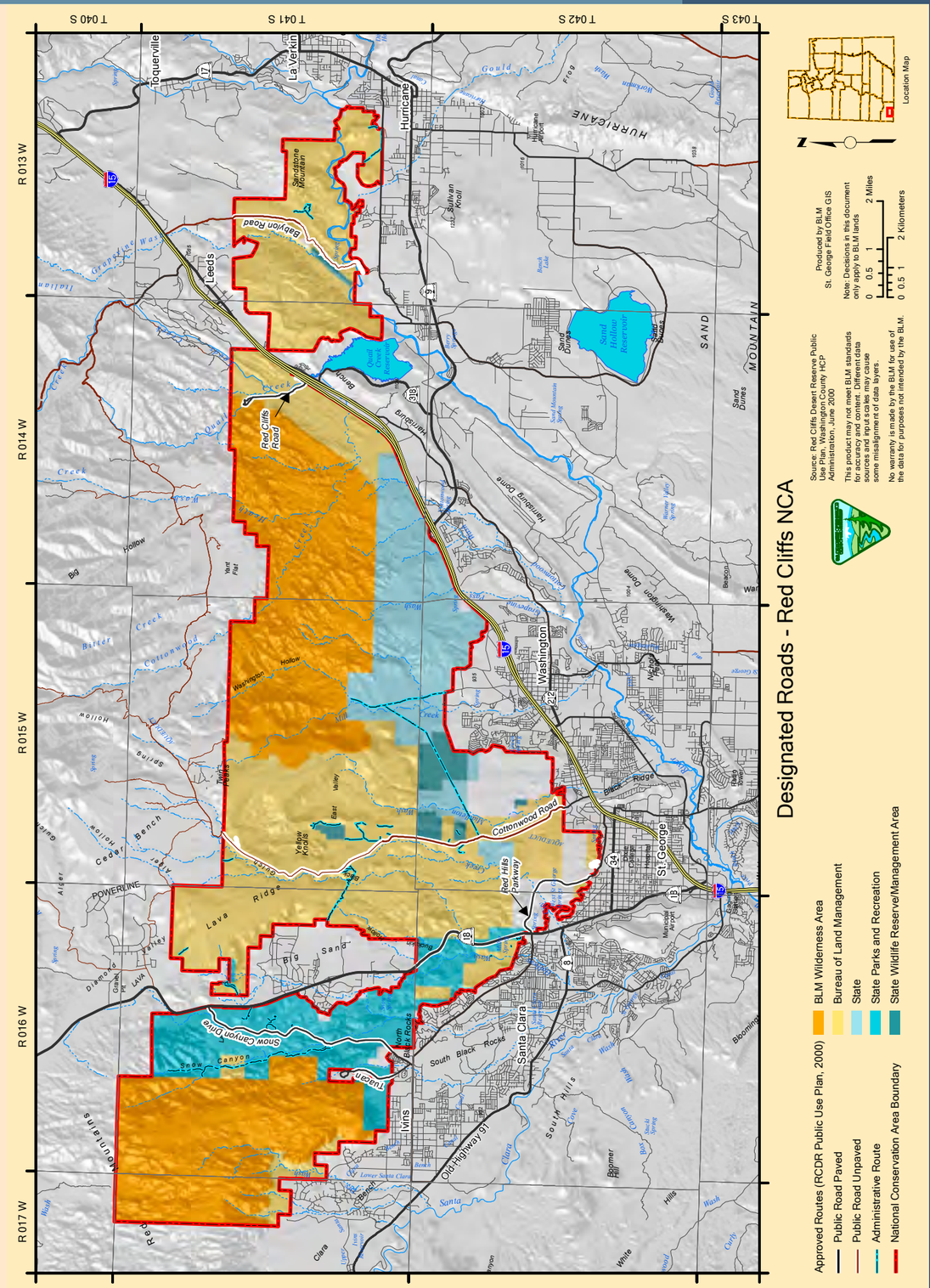
Motorized Use

Motorized vehicles are permitted on designated roads only, as shown on Map 3-54. This includes recreational vehicles, two-wheel-drive and four-wheel-drive vehicles, motorcycles, and all-terrain vehicles. Eleven roads in the Reserve were designated in the PUP as being open to motorized use by the public. Only six directly affect lands managed by BLM: Red Hills Parkway (formerly Turtle Road and Skyline Drive), Cottonwood Road, Turkey Farm Road, Babylon Road, Toquerville Cutoff, and Sand Cove Spur. Of these, the Red Hills Parkway and the southern portion of Cottonwood Road are paved. The City of St. George manages use on Red Hills Parkway and prohibits the use of OHVs on that road.

The Red Cliffs Recreation Area road is also paved (Photo 3-158) and available for motorized vehicle travel, although ATVs are not authorized in the developed campground and day use area. Motorized vehicle access to the Virgin River is a popular use of the Babylon Road, although road conditions beyond the Historic Babylon Trailhead are generally not appropriate for safe travel by full-sized vehicles.

All other roads are closed to the public, although many are open for administrative use. The majority of administrative roads are used by municipalities and

Photo 3-158 Red Cliffs Road in Red Cliffs Recreation Area, Red Cliffs NCA



power companies to access electrical transmission lines and water utilities.

Other Activities

Other activities that typically occur on public lands have not been authorized since the PUP was approved and implemented in 2001. Recreational activities that could damage habitats and potentially harm populations of desert tortoise or other at-risk species were not authorized in the Reserve. The following were identified as prohibited activities: paintball, in-line skating and skate boarding (except on paved municipal trails), horseshoes, darts, badminton, golf, remote-controlled aircraft, powered parachutes, and residential camping. Buggies, wagons, or other animal-drawn vehicles were limited to travel on designated roads, unless prohibited by local ordinance, and prohibited from single-track trails where their passage would create new surface disturbance.

Commercial Use

Thirteen companies currently hold SRPs to offer guided hikes, rock climbs, and mountain bike rides in the NCA. Commercial non-motorized use may be permitted on designated roads and trails, or at authorized climbing sites. Commercial motorized use may only be permitted on designated roads. All permit applications are first reviewed by BLM, and if it is determined to meet the agency's objectives, the application is then forwarded to the HCP Administrator for review and concurrence.

Organized competitive and recreational sporting events found to be low-impact to habitat are subject to the same screening and approval process as commercial use. An organized group activity is defined as any scheduled event with a specific planned purpose. Competitive events or organized group activities that could result in impacts on habitats, at-risk species populations, or other resource values of public lands are not permitted. Competitive or group events may only be permitted on designated roads, and only if all of the above criteria have been met.

In compliance with the Federal Lands Recreation Enhancement Act, recreation permit fees collected by the BLM are used to construct and maintain recreational infrastructure in the NCA and on other public lands managed by the SGFO. The current fee for commercial use is 3% of gross receipts. The fee for competitive or group events is $5 per person.

3.40.1.3 Recreational Impacts

All recreational users have the potential to impact the physical environment, with the most common impact being new user-created trails, sometimes referred to as "social trails." In some instances, new user-created trails are parallel routes heading to the same destination as the authorized route, but many are completely new trails to new and unauthorized destinations.

More than 100 miles of "social trails" have been illegally created within the NCA boundaries since the PUP was approved in 2001 (Photo 3-159). The proliferation of unauthorized, user-created trails is directly related to the PUP's designation of existing roads and trails for multiple recreation uses. The existing roads and trails were identified as the trail network for the Reserve, to avoid loss of additional tortoise habitat to new trail construction. The existing trails were not professionally designed for sustainability or for specific recreation users. The two-track roads that were included in the trail network did not typically provide high quality visitor experiences, as a majority served as access roads for power transmission lines or other utilities. Existing trails that crossed sandy or soft soils have, over time, degraded to the point that they are only suitable for one user group. When horses, mountain bikes, and hikers share the same trail in this type of soil, the trail tread will eventually become usable only by equestrians. As the trail tread is churned up by horses, hikers and mountain bikers can no longer easily negotiate that trail; these users will eventually abandon the trail or establish a parallel, but unauthorized, new trail.

"More than 100 miles of "social trails" have been illegally created within the Red Cliffs NCA boundaries since the PUP was approved in 2001."

Photo 3-159 Monitoring User-Created Trails, Red Cliffs NCA

Impact Monitoring

Recreation use impacts of the multi-jurisdictional lands of the Reserve have been monitored on an annual basis since 2005, using a protocol developed by Northern Arizona University's Outdoor Recreation Program. Monitoring is currently being conducted by faculty and students from Southern Utah University's Outdoor Recreation Program. Monitoring focuses on collecting data about the following impacts:

- Unauthorized increases in the number and size of trails and off-trail use in the Lowland Zone;
- Increased trail erosion;
- Increased incidences of campfire impacts;
- Vegetative impacts including biomass loss, composition changes, increased exotic and noxious weeds, and vegetative trampling and breakage;
- Disturbance of soil crusts;
- Increased equestrian impacts;
- General habitat disturbance including increased trail rutting and human-caused impacts such as litter, trash dumping, and human sanitary waste.

The focus of the impact monitoring program has been the Lowland Zone, largely because of its biological sensitivity, but also because much of it is in the urban interface and vulnerable to human impacts. The monitoring program is based on the fundamental tenets of Limits of Acceptable Change (LAC):

- All users are consumptive users;
- Resource impacts are the inevitable result of site use;
- The amount of change that will be tolerated on any site and the surrounding terrain is a managerial decision;
- Informed managerial decisions can only be made within an informed framework of social and physical data collection.

The goal of the monitoring program has been to identify current human-caused impacts from recreation, as well as forecast trends in visitor use and behaviors.

"The existing trails were not professionally designed for sustainability or for specific recreation users."

"New residents seeking recreational experiences on heavily promoted trails of the Reserve were often disappointed when they realized that this meant hiking on power line maintenance roads and other linear disturbances created by prior land uses, such as livestock grazing and utility development."

Monitoring began with a baseline trail inventory in 2005 and has continued on an annual basis. Data collected in 2010 showed that 23 of the 41 trails monitored (56%) have multiple (1-20+) illegal trails off of the designated trail. Off-trail impacts were being caused primarily by hikers (44.2%), followed by mountain bikers (31.2%), and equestrians (23.7%) (Northern Arizona University 2010).

Linear Disturbances Study

As part of the HCP implementation, Washington County fenced across all critical access points and urban interface boundaries in the Reserve to prevent motorized vehicle intrusions and other unauthorized uses. Motorized intrusions still occur, but they are infrequent and rarely occur in critical habitat.

In 2001, the PUP designated approximately 178 miles of non-motorized trails and associated trailheads at the most heavily used access points as available for public recreation use (Table 3-37). Of the 178 trail miles, 44 miles (26%) were existing two-track roads, the majority of which were power line or water line maintenance roads (Photo 3-160 and Photo 3-161). Nine miles (3%) were paved bicycle/pedestrian trails along State Route 18 and the Red Hills Parkway. Primitive routes, which were unmarked, undeveloped, and unmaintained trails, totaled approximately 47 miles (27%). Primitive routes, because of their popularity, were included on visitor maps and in interpretive publications. Developed and maintained singletrack totaled 79 miles (44%).

All other roads, trails, and linear disturbances that were not included in the 178 mile authorized trail system were officially closed. It was assumed that the authorized trail system, cobbled together as it was from a disparate mix of maintenance roads, singletrack, and livestock trails, would meet the recreational demands of the greater St. George metropolitan area well into the future, while adequately protecting critical habitat for desert tortoise and other at-risk species.

Between 2000 and 2007, the population of the greater St. George metropolitan area grew an average of 7% annually. Many of the newcomers were active retirees, drawn by Washington County's warm weather and abundant recreational opportunities. This population increase is considered the beginning of the boom in local non-motorized recreation, driven primarily by increasing numbers of road cyclists, triathletes, hikers, rock climbers, and mountain bikers.

An increase in recreational visits to the Reserve mirrored the population increase, and it was at this point that deficiencies in the existing trail system began to surface. New residents seeking recreational experiences on heavily promoted trails of the Reserve were often disappointed when they realized that this meant hiking on power line maintenance roads and other linear disturbances created by prior land uses, such as livestock grazing and utility development. Predictably, some users began to pioneer new routes that produced the kinds of backcountry experiences that they were seeking.

Although an annual recreation impacts monitoring program was initiated in 2005, the protocols did not collect data on many aspects of visitor use that were needed to understand why new social trails were being pioneered and why routes that had been officially closed continued to show signs of regular and often intensive use.

Table 3-37 Miles of Non-Motorized Trails by Route Type

PUP Zone	Road	Paved Trail	Singletrack Trail	Primitive Route	Total
Upland Zone	12	0	18	36	66
Lowland Zone	32	9	61	12	113
Total Miles	44	9	79	47	178

In 2012, NCA staff initiated a linear disturbances study to collect data, photograph, map, and describe all linear disturbances in the NCA and on adjacent non-federal lands included in the Reserve. This study produced the following data:

- The length of each disturbance;
- The average width of each disturbance;
- Who was using each linear disturbance;
- How often each linear disturbance was being used.

Map 3-55, Map 3-56, and Map 3-57 show the extent of the mapping project. Table 3-38 and Table 3-39 display some of the data from this study. Appendix K describes the methodologies used and includes additional findings from the study. These data were used in the development of the recreation section of the Draft RMP for Red Cliffs NCA to determine whether changes to the authorized trail system could reduce social trailing and resource impacts.

Photo 3-160 Power Line Maintenance Road Serving Double Duty as Non-Motorized Trail, Red Cliffs NCA

Photo 3-161 Water Pump Station Maintenance Road Serving Double Duty as Non-Motorized Trail, Red Cliffs NCA

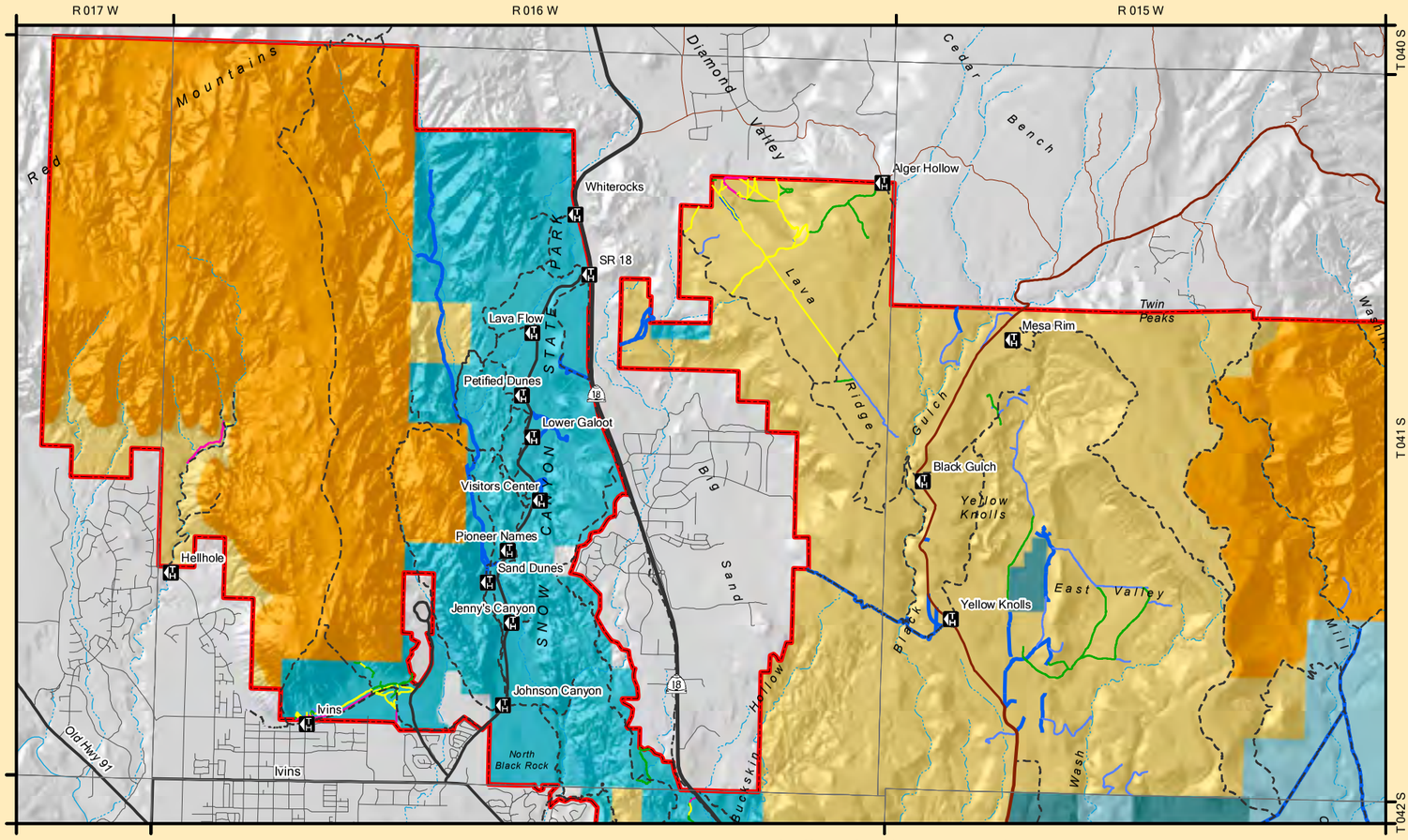
Table 3-38 Measured Linear Disturbances by Land Status

Linear Disturbance	BLM	State Parks	SITLA	State DWR	Private
Number of Miles	75	7	9	.25	13
Percent of Total Miles	72	7	9	<1	12

Table 3-39 Measured Linear Disturbances in PUP Zones

Linear Disturbance	Lowland Zone	Upland Zone	Total
Number of Miles	68	34	102

"Mistakes are painful when they happen, but years later a collection of mistakes is what is called experience."
–Denis Waitley, American Motivational Speaker, 1933–



Existing Linear Disturbances - Red Cliffs NCA (Northwest)

Existing Linear Disturbances (by use level)
- Heavy (multiple users daily)
- Medium (between twice a week and daily)
- Light (twice a week or less)
- Historic (used in the past but no current tracks)

- Trailhead
- Red Cliffs Campground
- Non-motorized Trail
- Administrative Route
- National Conservation Area Boundary

- BLM Wilderness Area
- Bureau of Land Management
- State
- State Parks and Recreation
- State Wildlife Reserve/Management Area

This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

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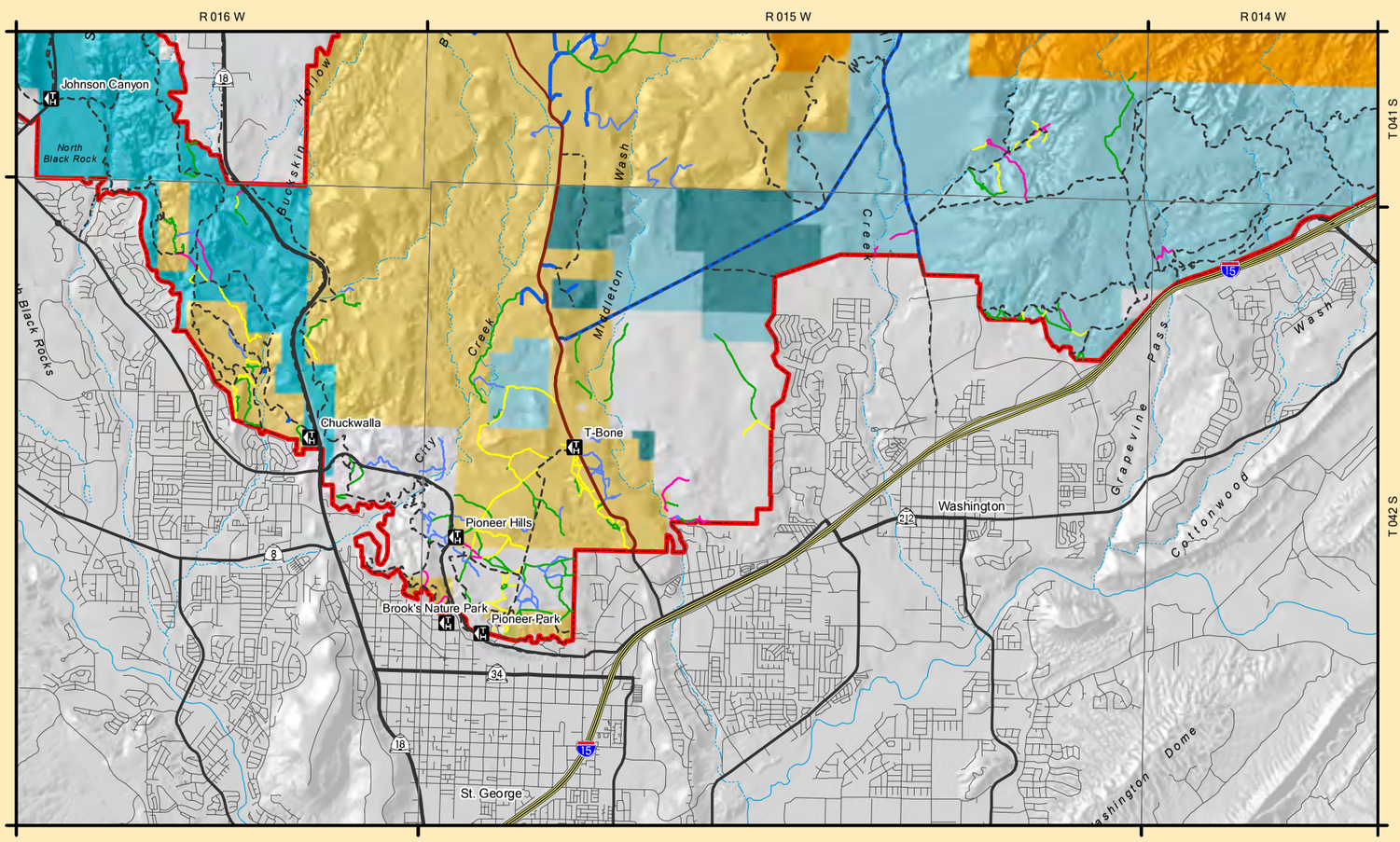
Note: Decisions in this document only apply to BLM lands

0 0.25 0.5 1 Miles
0 0.25 0.5 1 Kilometers

Location Map



Existing Linear Disturbances - Red Cliffs NCA (South)

Existing Linear Disturbances (by use level)
- Heavy (multiple users daily)
- Medium (between twice a week and daily)
- Light (twice a week or less)
- Historic (used in the past but no current tracks)

- Trailhead
- Red Cliffs Campground
- Non-motorized Trail
- Administrative Route
- National Conservation Area Boundary

- BLM Wilderness Area
- Bureau of Land Management
- State
- State Parks and Recreation
- State Wildlife Reserve/Management Area

This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.

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0 0.25 0.5 1 Miles
0 0.25 0.5 1 Kilometers

Location Map

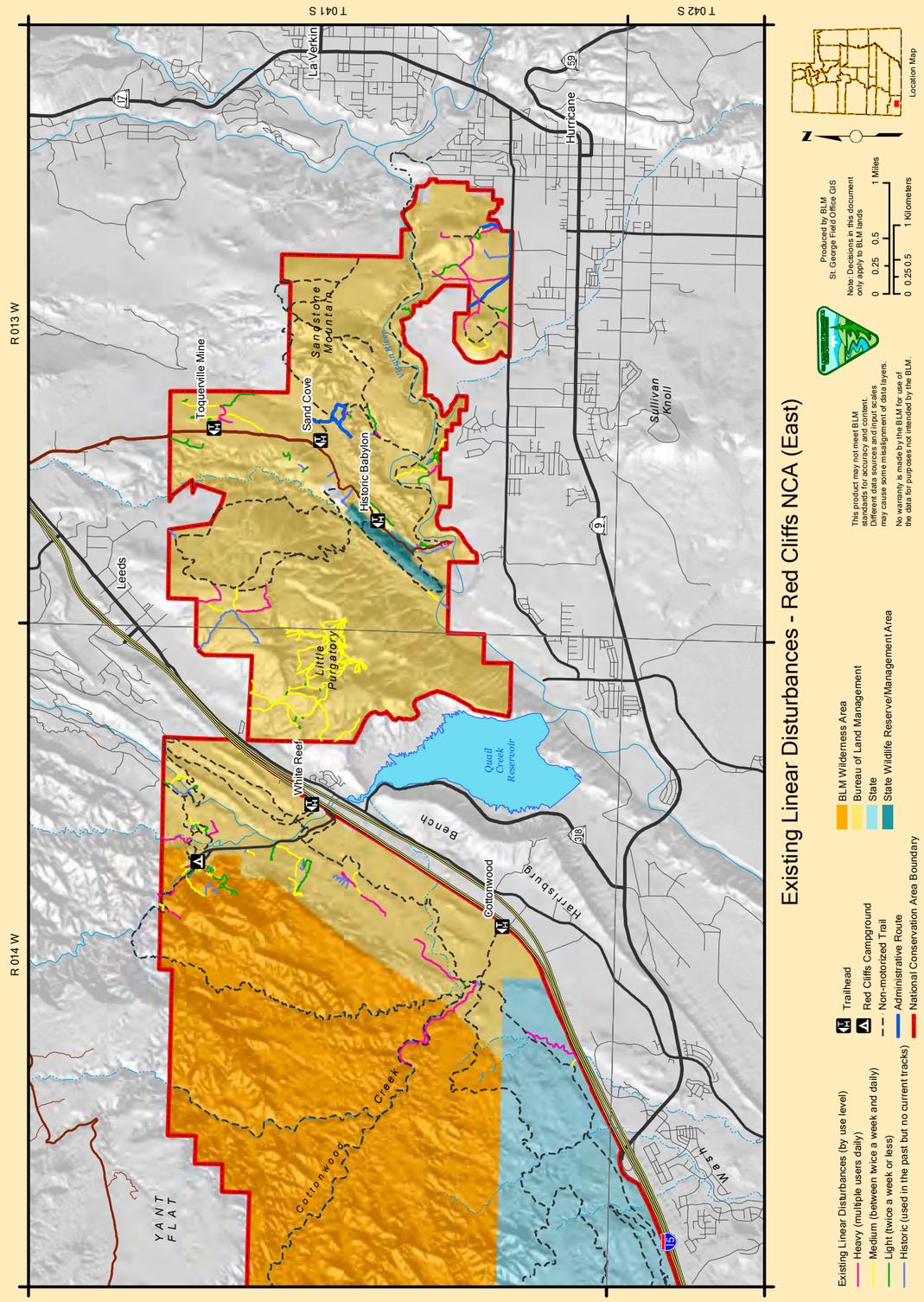


Photo 3-162 White Reef Trailhead, Red Cliffs NCA

3.40.2 Facilities

The recreational infrastructure of the NCA consists largely of trails and trailheads. However, with the acquisition of the White Reef area in 2000 and its inclusion within the Red Cliffs Recreation Area in 2013, two historic structures are now within the NCA. These include the 1863 Orson B. Adams House, a historic structure that has been rehabilitated to Secretary of the Interior Standards for adaptive re-use as an interpretive site, and the partial standing walls of a 1950's era Hollywood movie set. Map 3-58 displays the location of these structures and other heritage public use sites in the NCA.

Other recreation facilities in the NCA are located at trailheads, and typically include vault toilets, kiosks, interpretive panels, directional signs, and fences. Almost all the trails, with the exception of those in designated wilderness, have been signed, and all major roads leading into the NCA have portal signs.

3.40.2.1 Trails and Trailheads

With 81 trails and routes of varying length and difficulty, hiking, mountain biking, and horseback riding are popular activities in the NCA. Because federal, state, municipal, county, and private lands are all encompassed within the boundaries of the NCA, trails cross jurisdictional boundaries. There are 30 trailheads where visitors can park a vehicle and enter the NCA (Map 3-53 and Table 3-40). Fully developed trailheads typically contain designated parking, restroom facilities, and a kiosk that contains outreach (area orientation, regulatory, and educational) information (Photo 3-162). Less developed trailheads can have any combination of these amenities. Undeveloped access points (not shown in Table 3-40) may have undesignated parking, a stepover, a gate (Photo 3-163), and/or a simple bulletin board with orientation and regulatory information.

Photo 3-163 Undeveloped Access Point, Red Cliffs NCA

Some existing trailheads and access points are too small to meet demand. Others lack standardized kiosk facilities to display outreach information. As funding is available, BLM has begun to replace all kiosks at BLM-managed trailheads with standardized kiosk styles and outreach information.

There are three recognized trail types in the NCA: 1) signed and maintained singletrack; 2) signed and maintained two-tracks, which function as trails but may also serve as administrative access to municipal water and electrical utilities; and 3) primitive routes that are typically in dry washes, but that may

"With 81 trails and routes of varying length and difficulty, hiking, mountain biking, and horseback riding are popular activities in the Red Cliffs NCA."

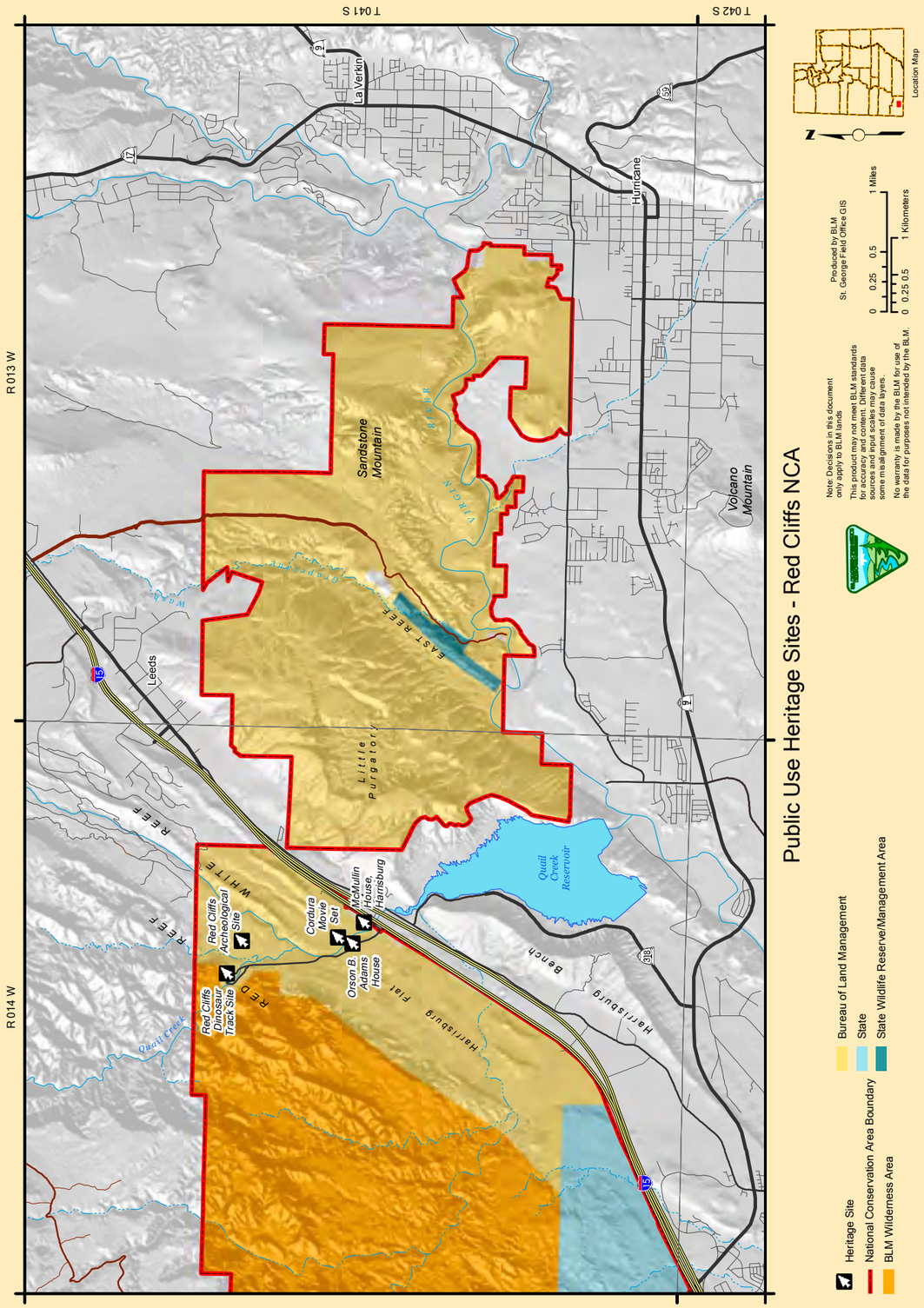


Table 3-40 Trailheads and Amenities

Trailhead	Administering Agency[1]	Amenities	Area
Black Gulch	BLM	Parking/Kiosk	Yellow Knolls
Brook's Nature Park	City of St. George	Parking	City Creek
Chuckwalla	State of Utah-State Parks	Parking/Kiosk/Restroom	Snow Canyon State Park
Cottonwood	BLM	Parking/Kiosk	Cottonwood
Hellhole	Private	Parking	Red Mountain
Historic Babylon	BLM	Parking/Kiosk	Babylon
Ivins	Ivins City	Parking/Kiosk	Red Mountain
Jenny's Canyon	State of Utah-State Parks	Parking	Snow Canyon State Park
Johnson Canyon	State of Utah-State Parks	Parking/Kiosk	Snow Canyon State Park
Lava Flow	State of Utah-State Parks	Parking/Kiosk	Snow Canyon State Park
Lower Galoot	State of Utah-State Parks	Parking/Restroom	Snow Canyon State Park
Mesa Rim	BLM	Parking/Kiosk	Snow Canyon State Park
Petrified Dunes	State of Utah-State Parks	Parking/Kiosk	Snow Canyon State Park
Pioneer Hills	BLM	Parking/Kiosk	City Creek
Pioneer Names A	State of Utah-State Parks	Parking	Snow Canyon State Park
Pioneer Names B	State of Utah-State Parks	Parking	Snow Canyon State Park
Pioneer Park A	City of St. George	Parking/Restroom/Kiosk	City Creek
Pioneer Park B	City of St. George	Parking/Kiosk	City Creek
Red Mountain	BLM	Parking/Kiosk/Restroom	Red Mountain
Sand Cove	BLM	Parking/Kiosk	Babylon
Sand Dunes	State of Utah-State Parks	Parking/Kiosk/Restroom	Snow Canyon State Park
Sandstone Mountain	BLM	Parking/Camping	Sandstone Mountain
SR 18	State of Utah-State Parks	Parking/Kiosk	Snow Canyon State Park
T-Bone	BLM	Parking/Kiosk	City Creek
Three Ponds	State of Utah-State Parks	Parking/Kiosk	Snow Canyon State Park
Toquerville Mine	BLM	Parking/Kiosk	Babylon
Upper Galoot	State of Utah-State Parks	Parking/Kiosk	Snow Canyon State Park
White Reef	BLM	Parking/Kiosk/Restroom	White Reef
White Rocks	State of Utah-State Parks	Parking/Kiosk	Snow Canyon State Park
Yellow Knolls	BLM	Parking/Kiosk	Yellow Knolls

[1]Non-federal administering agencies are included because the trailheads provide access to BLM-managed public lands.

"Dreams come true; without that possibility, nature would not incite us to have them."
–John Updike, Novelist, 1932–2009

travel cross-country for short distances on well-used, user-defined routes (Table 3-41). Primitive routes are found in the Red Mountain and Cottonwood Canyon Wilderness areas (Photo 3-164).

3.40.2.2 Trail and Trailhead Visitation

Trail use in the NCA consists of hiking, mountain biking, and horseback riding. Trail visitation is tracked by BLM using digital traffic counters of two types: the first detects metal and can be programmed to distinguish between full-size vehicles, ATVs, or mountain bikes; the second operates on infrared and records a count when body heat breaks the infrared beam. The digital counters provide accurate visitation data and have been in use since 2009 in the NCA. The counters are typically left in a specific location for one year and then moved to a new location. Over time, accurate visitation data can be collected through traffic counters, supplemented by trail registers and staff observations. Annual visitation is recorded in the BLM's online Recreation Management Information System (RMIS). Data for 2013 visits are shown in Table 3-42, linked to specific sub-areas or groupings of trails that are either accessed from the same trailhead or are in geographic proximity to each other.

3.40.2.3 Red Cliffs Recreation Area

The Red Cliffs Recreation Area is an Expanded and Standard Amenity Fee Site that is open for use year-round and popular with both overnight campers and day users (Photo 3-165). It is located just west of I-15, 14 miles northeast of St. George, Utah (Map 3-59). Popular day use activities include hiking on the several trails that originate in the campground/day use area, visiting the interpreted public use sites that educate visitors about paleontological and heritage resources, and enjoying picnics or barbecues in the day use area.

The Recreation Area has numerous amenities, including facilities and services, as shown in Table 3-43. The day use area includes designated paved parking, picnic tables, garbage receptacles, fire pits, barbeque grills, a potable water spigot, and information and regulatory signage. The campground has 11 campsites, each with designated paved parking, fire pits, barbeque grills, shade shelters, picnic tables, and potable water available from seven centralized water spigots. Two vault toilets and trash dumpsters in centralized

Photo 3-164 Hellhole Trail, Primitive Route in Red Mountain Wilderness, Red Cliffs NCA

Table 3-41 Red Cliffs NCA Non-Motorized Trails and Routes

Table 3-41 Red Cliffs NCA Non-Motorized Trails and Routes						
Trail	Agency	Trail User	Trail Type	Area	Miles	BLM Miles
600 North	BLM	Hikers, Equestrians	Two-Track	Hurricane Cinder Knolls	1.13	1.13
Adams	BLM	Hikers	Singletrack	White Reef	0.03	0.03
Adit	BLM	Hikers, Bikers, Equestrians	Two-Track	White Reef	0.23	0.23
Alger Hollow	BLM	Hikers, Bikers, Equestrians	Two-Track	Broken Mesa	2.08	2.08
Anasazi	BLM	Hikers, Bikers, Equestrians	Singletrack	Red Cliffs Recreation Area	0.50	0.50
Arch	BLM	Hikers, Equestrians	Singletrack	Babylon	0.51	0.51
Babylon	BLM	Hikers, Bikers, Equestrians	Two-Track	Babylon	1.35	1.35
Beck Hill	BLM/State Parks	Hikers, Bikers, Equestrians	Singletrack	Paradise Canyon	1.43	0.30
Black Knolls	BLM/DWR	Hikers, Equestrians	Singletrack	Broken Mesa	1.68	0.81
Bone Wash	SITLA	Hikers, Equestrians	Wash	Mill Creek	1.88	0.00
Bracken's Loop	SITLA	Hikers, Equestrians	Singletrack	Grapevine	5.42	0.00
Broken Mesa Rim	BLM	Hikers, Bikers, Equestrians	Singletrack	Broken Mesa	4.35	4.35
Brook's Nature Trail	BLM/City of St. George	Hikers	Singletrack	City Creek	0.23	0.11
Chuckwalla	BLM/State Parks	Hikers, Bikers, Equestrians	Two-Track	Paradise Canyon	0.91	0.77
Church Rocks	SITLA	Hikers, Bikers, Equestrians	Singletrack	Grapevine	1.89	0.00
Church Rocks Connector	SITLA	Hikers, Bikers, Equestrians	Singletrack	Grapevine	0.10	0.00
Cinder Knoll Loop	BLM	Hikers, Bikers, Equestrians	Two-Track/ Singletrack	Babylon	0.85	0.85
City Creek	BLM/City of St. George	Hikers, Equestrians	Two-Track/ Singletrack	City Creek	2.94	0.09
Coachwhip	SITLA	Hikers, Equestrians	Singletrack	Grapevine	0.43	0.00
Connector	BLM	Hikers, Bikers	Singletrack	White Reef	0.04	0.04
Cordura	BLM	Hikers, Bikers	Singletrack	White Reef	0.24	0.24
Cottontail	DWR	Hikers, Bikers, Equestrians	Two-Track	Middleton	0.59	0.00
Cottonwood Canyon	BLM	Hikers, Equestrians	Wash	Cottonwood	6.04	6.04
Cottonwood Hills	BLM/SITLA	Hikers, Bikers, Equestrians	Wash	Cottonwood	2.89	1.90
Dino Cliffs	SITLA	Hikers, Bikers, Equestrians	Singletrack	Grapevine	1.82	0.00
East Cinder Knoll	BLM	Hikers, Bikers, Equestrians	Two-Track	Hurricane Cinder Knolls	0.61	0.61
East Reef	BLM/DWR/Private	Hikers, Bikers, Equestrians	Two-Track	Babylon	1.99	1.00

Table 3-41 Red Cliffs NCA Non-Motorized Trails and Routes

Trail	Agency	Trail User	Trail Type	Area	Miles	BLM Miles
Elephant Arch	SITLA	Hikers, Equestrians	Singletrack	Mill Creek	0.39	0.00
Flicker	BLM	Hikers, Bikers, Equestrians	Two-Track	Babylon	0.23	0.23
Fortitude	BLM	Hikers	Primitive Route	Red Mountain	0.46	0.46
Gap	BLM	Hikers, Bikers, Equestrians	Singletrack	Paradise Canyon	0.36	0.36
Gecko	BLM	Hikers, Bikers, Equestrians	Singletrack	Paradise Canyon	0.26	0.26
Grapevine	SITLA/Private	Hikers, Bikers, Equestrians	Two-Track	Grapevine	3.17	0.00
Grapevine Wash	SITLA	Hikers	Wash	Grapevine	0.11	0.00
Gunsight	BLM/State Parks	Hikers	Primitive Route	Red Mountain	1.10	0.78
Halfway Wash	BLM	Hikers, Bikers, Equestrians	Two-Track	Paradise Canyon	0.59	0.59
Heath	BLM	Hikers, Equestrians	Wash	Cottonwood	2.56	2.56
Hellhole	BLM/Private	Hikers	Wash	Red Mountain	2.09	2.04
Hellhole Spur	BLM	Hikers	Wash	Red Mountain	0.21	0.21
Hell's Half Acre	BLM	Hikers, Equestrians	Primitive Route	Little Purgatory	0.78	0.78
High Grade	BLM	Hikers, Bikers	Two-Track/ Singletrack	White Reef	0.18	0.18
High Point	BLM	Hikers, Bikers, Equestrians	Two-Track	Broken Mesa	1.12	1.12
Historic Babylon	BLM	Hikers, Bikers, Equestrians	Singletrack	Babylon	3.35	3.35
Ice House	BLM/DWR/SITLA	Hikers, Bikers, Equestrians	Singletrack	Broken Mesa	5.90	5.55
Lange's Dugway	BLM	Hikers, Bikers, Equestrians	Two-Track	Broken Mesa	4.59	4.59
Leed's Reef	BLM	Hikers, Bikers, Equestrians	Two-Track	White Reef	1.44	1.44
Little Purgatory	BLM	Hikers, Bikers, Equestrians	Singletrack	Little Purgatory	2.11	2.11
McMullin	BLM	Hikers, Bikers	Singletrack	White Reef	0.05	0.05
Middleton Powerline	BLM/DWR/SITLA	Hikers, Bikers, Equestrians	Two-Track	Middleton	3.52	0.00
Mill Creek	BLM/SITLA	Hikers, Equestrians	Wash	Cottonwood	5.95	3.06
Mine Shaft	BLM/Private	Hikers, Bikers, Equestrians	Two-Track	Babylon	0.44	0.44
Mustang Pass	BLM/SITLA	Hikers, Equestrians	Two-Track/ Singletrack	Mill Creek	2.59	1.10
Owen's Loop	BLM/City of St. George	Hikers, Bikers, Equestrians	Two-Track/ Singletrack	City Creek	1.76	0.76

Table 3-41 Red Cliffs NCA Non-Motorized Trails and Routes

Trail	Agency	Trail User	Trail Type	Area	Miles	BLM Miles
Padre Canyon	BLM/State Parks/ Private	Hikers	Singletrack	Red Mountain	2.39	1.71
Paradise Rim	BLM/State Parks	Hikers, Bikers, Equestrians	Singletrack	Paradise Canyon	1.20	1.05
Pioneer Hills	BLM/City of St. George	Hikers, Bikers, Equestrians	Two-Track	City Creek	0.71	0.12
Pioneer Rim	BLM/City of St. George	Hikers, Bikers, Equestrians	Singletrack	City Creek	1.69	0.90
Prospector	BLM/SITLA/Private		Singletrack	Cottonwood	8.93	4.91
Raven	BLM	Hikers, Equestrians	Two-Track	Sandstone Mountain	0.91	0.57
Red Mountain	BLM/State Parks/City of Ivins	Hikers, Equestrians	Primitive Route	Red Mountain	8.80	8.20
Red Reef	BLM/USFS	Hikers, Equestrians	Primitive Route	Cottonwood	5.93	5.10
Red Reef East	BLM	Hikers, Bikers, Equestrians	Two-Track	White Reef	0.89	0.89
Red Tail	BLM	Hikers, Equestrians	Two-Track	Sandstone Mountain	1.05	1.02
Rusty Cliffs	BLM/State Parks/City of St. George	Hikers, Bikers, Equestrians	Two-Track/ Singletrack	Paradise Canyon	3.37	0.84
Sand Hill	SITLA	Hikers, Equestrians	Singletrack	Mill Creek	1.98	0.00
Sandstone Mountain	BLM	Hikers, Equestrians	Two-Track	Sandstone Mountain	2.15	2.15
Scout Cave	BLM/State Parks	Hikers, Equestrians	Singletrack	Paradise Canyon	2.76	0.55
Sidewinder	BLM	Hikers, Equestrians	Singletrack	Sandstone Mountain	0.96	0.96
Silver Reef	BLM	Hikers	Singletrack	Red Cliffs Recreation Area	0.16	0.16
Snow Canyon Overlook	BLM	Hikers, Equestrians	Singletrack	Red Mountain	0.47	0.47
Spanish Wash	SITLA	Hikers, Equestrians	Wash	Grapevine	0.89	0.00
T-Bone	BLM/City of St. George	Hikers, Bikers, Equestrians	Two-Track	City Creek	1.89	1.31
Three Ponds	BLM/State Parks	Hikers	Singletrack/ Wash	Red Mountain	1.67	0.48
Tipple	BLM	Hikers, Bikers, Equestrians	Two-Track	White Reef	1.00	1.00
Turtle Wall	BLM	Hikers, Bikers, Equestrians	Singletrack	Paradise Canyon	0.98	0.98
Virgin River	BLM/Water Conservancy District	Hikers, Equestrians	Primitive Route	Babylon	5.29	4.13
Washington Hollow	BLM/SITLA	Hikers, Equestrians	Wash	Cottonwood	3.98	3.90
West Cinder Knoll	BLM	Hikers, Bikers, Equestrians	Two-Track	Hurricane Cinder Knolls	0.47	0.47

Table 3-41 Red Cliffs NCA Non-Motorized Trails and Routes						
Trail	Agency	Trail User	Trail Type	Area	Miles	BLM Miles
White Reef	BLM	Hikers, Bikers, Equestrians	Two-Track	White Reef	1.70	1.70
Winchester	BLM	Hikers, Bikers, Equestrians	Singletrack	Broken Mesa	1.64	1.64
Yellow Knolls	BLM	Hikers, Equestrians	Singletrack	Broken Mesa	1.93	1.93
				Mileage Total	153.26	102.10

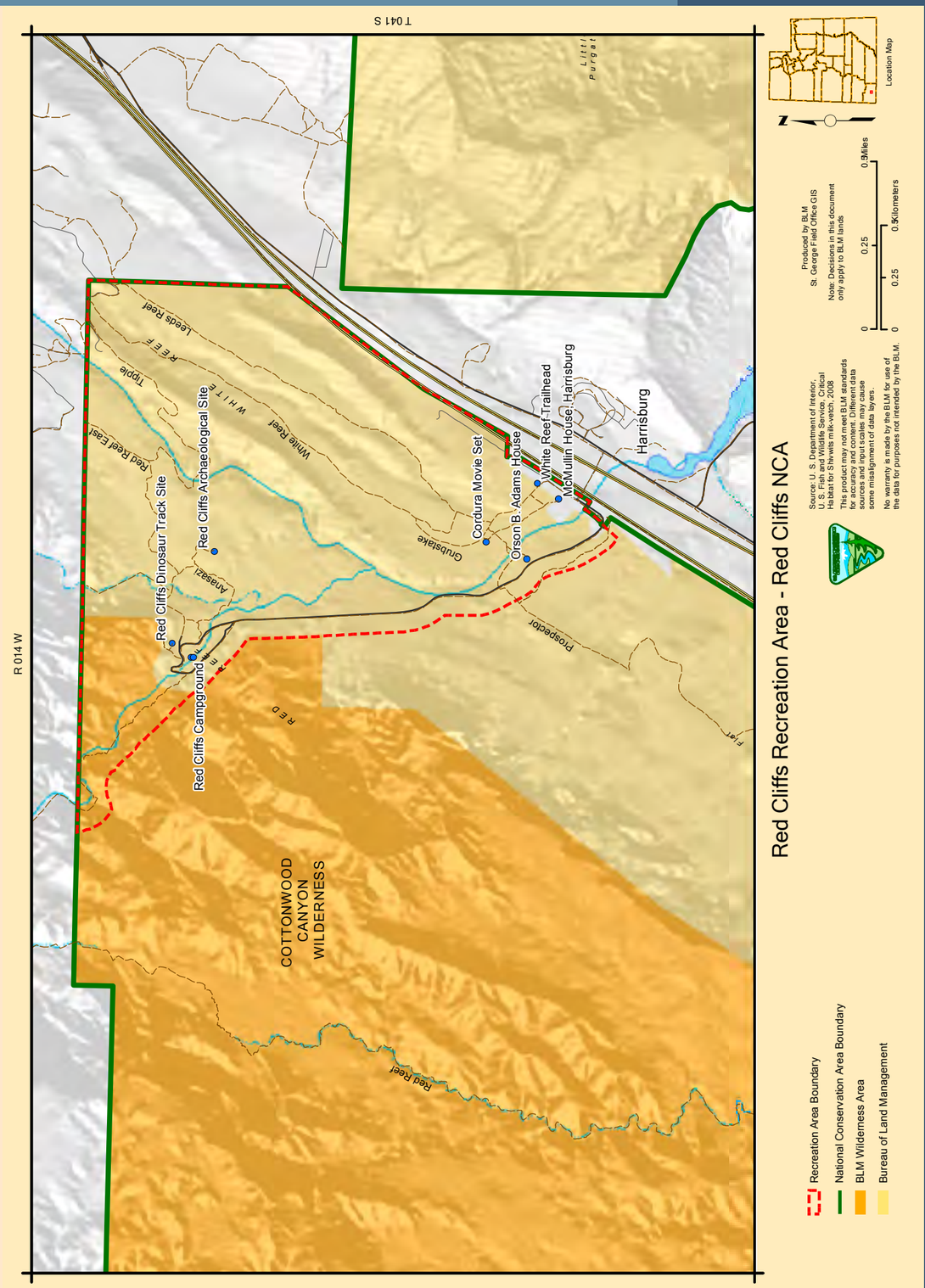
Table 3-42 Visits by Sub-Area

Trail System	Primary Activity	Secondary Activity	Occasional Activity	Visits 2013
Babylon	Hiking	OHV	Mountain Biking	5,940
City Creek	Hiking	Mountain Biking	Rock Scrambling	6,991
Cottonwood Canyon	Mountain Biking	Hiking	Equestrian	16,194
Cottonwood Road	Mountain Biking	Hiking	---	4,898
Paradise Canyon	Rock Climbing	Hiking	Mountain Biking	21,439
Red Cliffs Recreation Area	Hiking	Camping	---	33,200
Red Mountain	Hiking	Equestrian	---	14,601
White Reef	Hiking	Equestrian	Mountain Biking	2,312
			Total Visits	105,575

Table 3-43 Red Cliffs Recreation Area Amenities

Facilities							
Information Kiosks	Interpretive Stations	Shade Shelters	Vault Toilets	Campsites	Day Use Area	Garbage Dumpsters	Non-Motorized Trails
Services							
Law Enforcement	Park Ranger	Toilet Janitorial	Toilet Pumping	Potable Water	Waste Disposal	Maintenance	Information Brochures

Photo 3-165 Red Cliffs Recreation Area, Red Cliffs NCA



"SUNCLF is a non-profit "friends" group established in 2011 to increase public awareness and citizen stewardship of public lands and resources in the Beaver Dam Wash and Red Cliffs NCAs."

locations serve both the day use area and the campsites. Both the day use area and the campsites offer accessible facilities that comply with the Architectural Barriers Act Accessibility Standards. Several non-motorized trails can be accessed directly from the Recreation Area.

Because of the limited number of campsites, the campground is generally filled to capacity every day during the peak seasons of spring and fall. Separate fees are collected for overnight and day use, with current fees set at $15 for overnight camping and $5 per vehicle for day use. Payment is made through fee envelopes and "iron ranger" collection devices, with fee envelopes removed on a regular basis. When a visitor fills out an envelope, the information collected includes number of individuals in the party and the length of stay; these data are then compiled by BLM for accurate visitation tracking.

Table 3-44 displays visitation data for the Recreation Area over the past six years. In 2010, the Recreation Area was closed for a four-month period during the summer months, while the access road was being repaved, lowering visitation for that year. 2014 also shows lower visitation as a result of a two-month closure due to bridge construction and facility upgrades.

The increasing popularity of the Recreation Area has created management challenges, as the existing day use parking cannot accommodate the number of visitors who wish to enjoy the site during peak seasons.

3.40.3 Interpretation/Visitor Understanding

Information is available from the Interagency Public Lands Information Center, in St. George, which also serves as office space for the NCA staff and the SGFO. The Center is staffed with agency personnel and/or volunteers and provides the public with information about the NCA, the Red Cliffs Desert Reserve, and Snow Canyon State Park.

3.40.3.1 Trailhead Interpretation

Trailheads are defined as an area having designated vehicle parking and a major access point. Trailhead information varies by location, but each trailhead on public lands currently provides, at a minimum, an area map and orientation information. As funding has permitted, BLM has been installing new kiosks at trailheads that are of a standardized design and include an orientation panel with a detailed trail map as well as full-color interpretive panels for resources specific to that area of the NCA (Photo 3-166).

3.40.3.2 Regulatory Information

Each trail or route begins at an access point, usually denoted by a stepover (a barrier to prevent trail access by OHVs). Rules and regulation signs are posted at these access points, informing users of prohibited activities within the recreation zones of Lowland, Upland, or all zones.

3.40.3.3 Public Outreach

Public outreach and environmental education programs and activities are conducted by NCA staff, in partnership with the Southwest Utah National Conservation Land Friends (SUNCLF).

Table 3-44 Red Cliffs Recreation Area Visitation

Year	2009	2010	2011	2012	2013	2014
Day Use Visitors	20,170	20,616	31,770	32,811	29,246	26,625
Campers	4,190	3,152	4,116	5,055	4,583	3,986
Total	24,360	23,768	35,886	37,866	33,829	30,611
Source: BLM RMIS Database						

SUNCLF is a non-profit "friends" group established in 2011 to increase public awareness and citizen stewardship of public lands and resources in the Beaver Dam Wash and Red Cliffs NCAs. Examples of these programs include National Public Lands Day clean-up activities in the NCAs, curriculum-based field experiences for local schools, and volunteer opportunities for archaeological and paleontological site stewardship (Photo 3-167), migratory bird counts, and habitat restoration projects.

Maps and Brochures

A new Visitor's Guide is currently being prepared by BLM to provide more accurate trail data and information on the Red Cliffs NCA. Some of this information is currently available in the SGFO Visitor's Guide, a 1:100,000 scale land status map that includes trails, trailheads, and special designation lands managed by the SGFO. The brochure side of this map provides regulatory and interpretive information about the special designation lands, including the NCAs, wilderness areas, wild and scenic rivers, and the Old Spanish National Historic Trail.

A brochure describing the Red Cliffs Recreation Area is available from the Interagency Public Lands Information Center in St. George and can be downloaded from the NCA website.

Photo 3-166 Typical Trailhead Kiosk, Red Cliffs NCA

Photo 3-167 Citizen Stewardship: Graffiti Removal at Archaeological Site, Red Cliffs NCA

"Our nation's future relies on a well-educated public to be wise stewards of the very environment that sustains us, our families and communities, and future generations. It is environmental education which can best help us as individuals make the complex, conceptual connections between economic prosperity, benefits to society, environmental health, and our own well-being."
–No Child Left Inside Coalition

NCA Website

The St. George Field Office maintains a website that contains information about every aspect of the NCA. There are dozens of pages that cover everything from planning, to tortoise recovery, to recreation opportunities at www.blm.gov/sgfo (BLM 2014).

Visitor Satisfaction Survey

In April of 2011, the NCA was selected as one of 24 sites nationally for a Visitor Satisfaction Survey, as part of BLM's annual assessment of how well agency-operated recreation facilities are meeting the standards established in the Government Performance and Results Act (GPRA). Goal 3.1 of the GPRA states: "Provide for a quality recreation experience, including access, and enjoyment of natural and cultural resources on DOI managed and partnered lands and waters"; Goal 3.2 states: "Provide for and receive fair value in recreation." The survey consisted of two pages of questions with multiple choice answers and was approved by the U.S. Office of Management and Budget. The survey methodology was reviewed and approved by the BLM National Operations Center in Denver, Colorado.

The survey was conducted at five intensively-used trailheads on multiple weekends during April 2011. A ten-person crew from the American Conservation Experience (ACE) was used to administer the survey. Two ACE employees were stationed at each trailhead from 9am to 5pm, Friday, Saturday, and Sunday to ensure that an adequate sample of responses was obtained.

A total of 400 surveys were completed and the results compiled and analyzed by the University of Idaho, Department of Outdoor Recreation. The overall GPRA Satisfaction Measure was 90%, representing the number of respondents who were satisfied with the facilities, services, and recreational opportunities of the NCA. Table 3-45 shows a percentage breakdown of the overall GPRA satisfaction measure.

"The overall GPRA Satisfaction Measure was 90%, representing the number of respondents who were satisfied with the facilities, services, and recreational opportunities of the Red Cliffs NCA."

3.41 COMPREHENSIVE TRAVEL AND TRANSPORTATION MANAGEMENT

The reader is referred to the Affected Environment for Beaver Dam Wash NCA for a description of BLM's TTM process and the definitions of OHV area designations ("open," "limited," and "closed") that provide the land use planning level framework within which individual route designations are made through implementation-level planning. Table 3-46 shows the current OHV area designations for the NCA that were made through the 1999 SGFO RMP. Map 3-60 shows the locations of the area designations. The PUP designated the roads and routes described below for motorized vehicle travel in 2000.

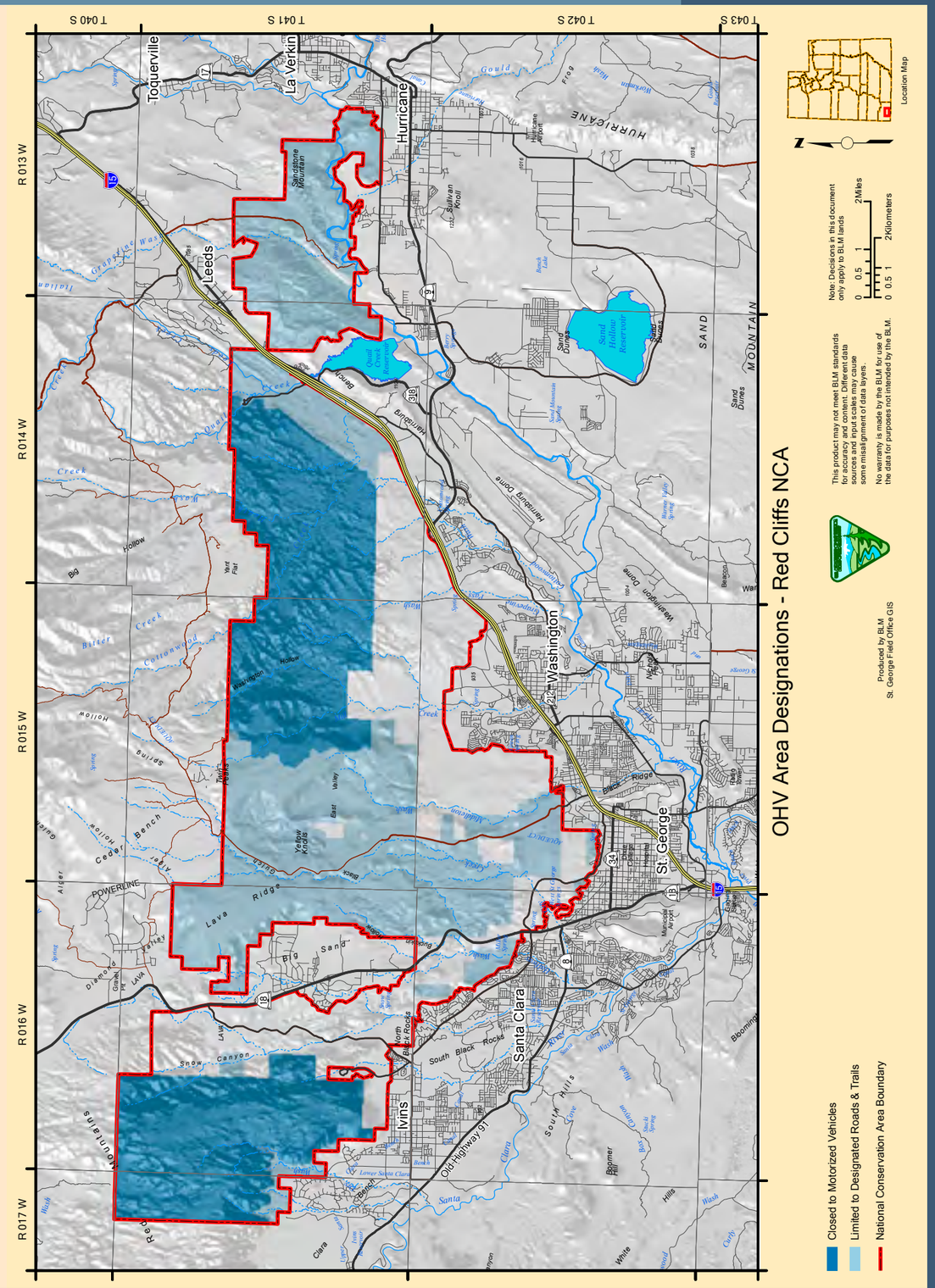
Motorized vehicles, including recreational vehicles, two-wheel-drive and four-wheel-drive vehicles, motorcycles, and all-terrain vehicles, are authorized to travel only on designated roads in the NCA. Eleven roads were designated

Table 3-45 Overall Quality of Recreation Experience from Visitor Satisfaction Survey

Very Good	Good	Average	Poor	Very Poor
41%	49%	9%	1%	0%

Table 3-46 OHV Area Designations

Designation	Acres
Open	0
Limited to Existing Roads and Trails	0
Limited to Designated Roads and Trails	24,870
Closed	19,989



"Non-federal lands remain within the boundaries of the Red Cliffs NCA that could be acquired from willing sellers or land administrators."

in the PUP as open to motorized use by the public. Six of the 11 designated roads traverse public lands of the NCA: Red Hills Parkway (formerly Turtle Road and Skyline Drive), Cottonwood Road, Turkey Farm Road, Babylon Road, Toquerville Cutoff, and Sand Cove Spur. Of the designated roads, only the Red Hills Parkway and the southern portion of Cottonwood Road are paved. The City of St. George manages use on Red Hills Parkway and prohibits the OHV travel on that road. The Red Cliffs Recreation Area Road, which was not included in the PUP, is also paved and is authorized for motorized vehicle travel, although OHVs are prohibited from traveling within the developed campground and day use area.

All other roads within the NCA are closed to motorized vehicle travel by the public, although many are open for administrative use by municipalities and power companies to access electrical transmission lines and water utilities.

Detailed information on the non-motorized trail network can be found in the Recreation section above. As described for the Beaver Dam Wash NCA, BLM will identify OHV area designations for Red Cliffs NCA in this document and is currently developing a TMP for Washington County public lands that will identify alternatives for specific route designations.

3.42 LANDS AND REALTY

3.42.1 Land Tenure Adjustments

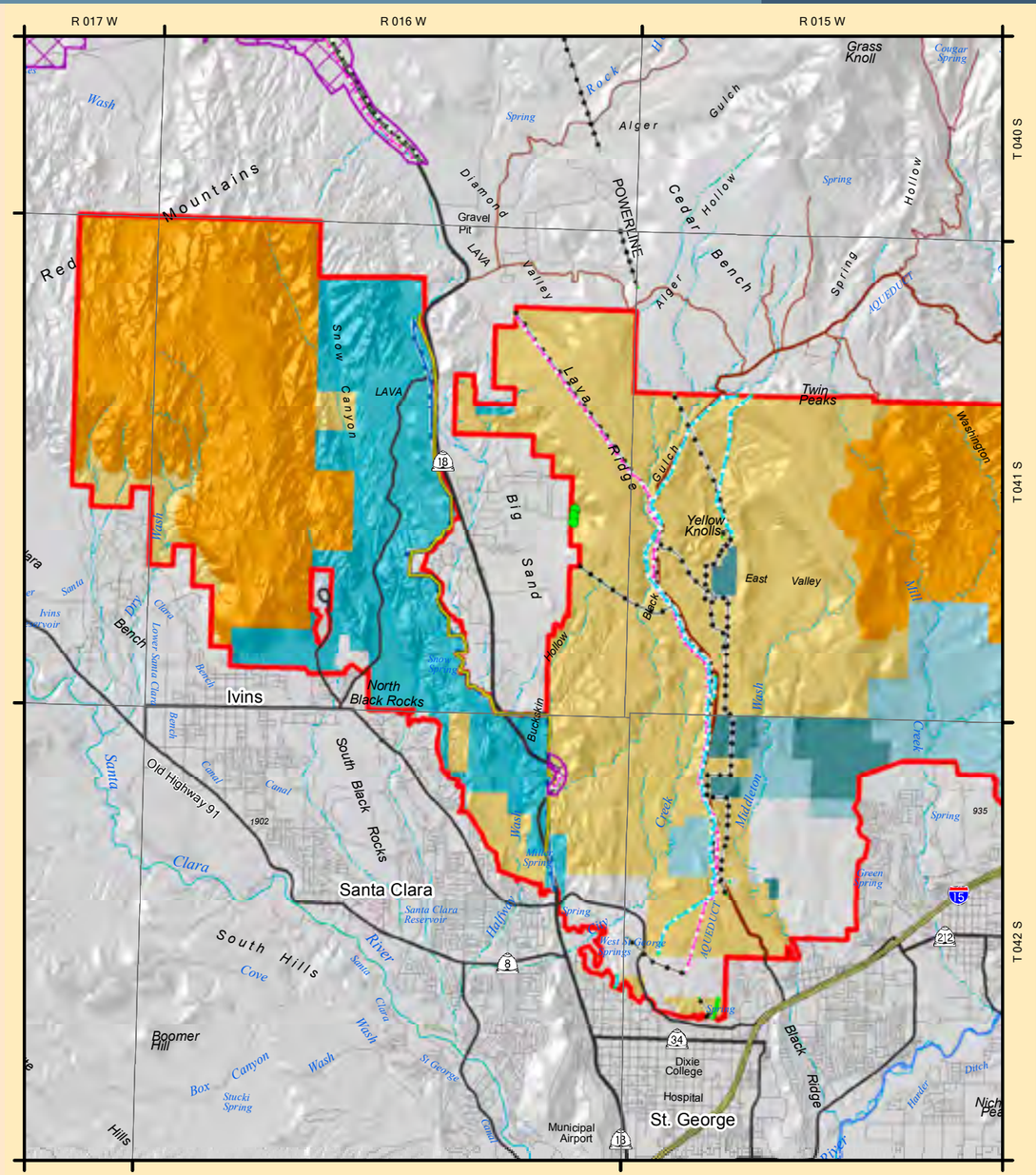
Since 1996, the SGFO has assisted Washington County in the furtherance of its HCP commitments through land tenure adjustments designed to acquire private land inholdings into federal ownership in the. During the 17-year period between 1996 and 2013, a total of 6,374 acres were acquired, primarily by land exchange, with private inholdings being exchanged at fair market value by willing owners for public lands elsewhere in Washington County. Other private inholdings were acquired through donations and direct purchases with Land and Water Conservation Funds. Although BLM has been the primary agency to acquire lands, Utah State Parks and UDWR have also actively pursued acquisitions of private inholdings in the Reserve, using federal funds provided under Section 6 of the ESA.

Non-federal lands remain within the boundaries of the NCA that could be acquired from willing sellers or land administrators. Certain tracts are encumbered with previous developments such as large retention basins, a large water tank, and a former municipal landfill which has been remediated and capped.

3.42.2 Linear ROWs and Site Type Leases

In 1999, the SGFO RMP designated all public lands in today's NCA as a ROW Avoidance area. This designation was intended to further the goals and objectives of Washington County's HCP, by protecting habitat for Mojave desert tortoise and other at-risk species from impacts and loss to the construction of new power transmission lines, water lines, communication sites or other facilities. Since wilderness designation in 2009, the Cottonwood Canyon and Red Mountain Wilderness areas have been managed as ROW Exclusion areas. Since 1999, no new ROWs have been granted in the Avoidance area, although upgrades to an existing Rocky Mountain power transmission line and associated substation were authorized. Refer to Maps 3-61, Map 3-62, and Map 3-63 for ROWs and Avoidance/Exclusion areas.

Management direction for the ROW Avoidance areas stated that new ROWs would only be granted in these areas when feasible alternative routes or designated corridors were not available. Measures to reduce resource impacts would be applied on a site-specific basis, should new ROWs be granted (BLM 1999). Management direction for the



Right-of-Ways (West) - Red Cliffs NCA

Right-of-Way
Right-of-Way (line or area by type)
Fiber Optic Line
Natural Gas Pipeline
Powerline
Road
Telephone Line
Water Pipeline
Other
Utility Corridor

National Conservation Area Boundary
BLM Wilderness Area
Bureau of Land Management
State
State Parks and Recreation
State Wildlife Reserve/Management Area

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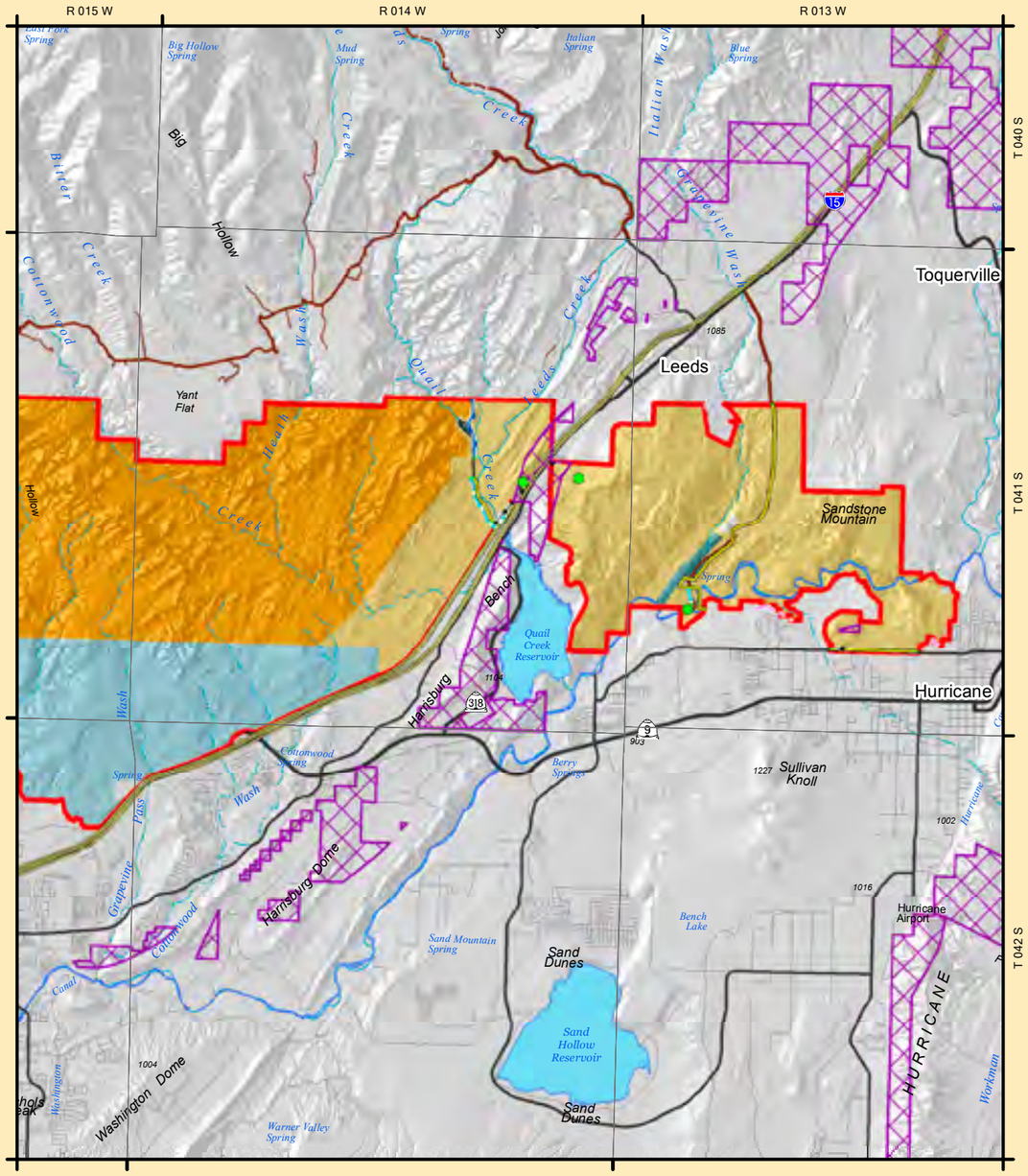
No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

Note: Decisions in this document only apply to BLM lands

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

Location Map



Right-of-Ways (East) - Red Cliffs NCA

- Right-of-Way
- Right-of-Way (line or area by type)
- Fiber Optic Line
- Natural Gas Pipeline
- Powerline
- Road
- Telephone Line
- Water Pipeline
- Other
- Utility Corridor
- National Conservation Area Boundary
- BLM Wilderness Area
- Bureau of Land Management
- State
- State Parks and Recreation
- State Wildlife Reserve/Management Area

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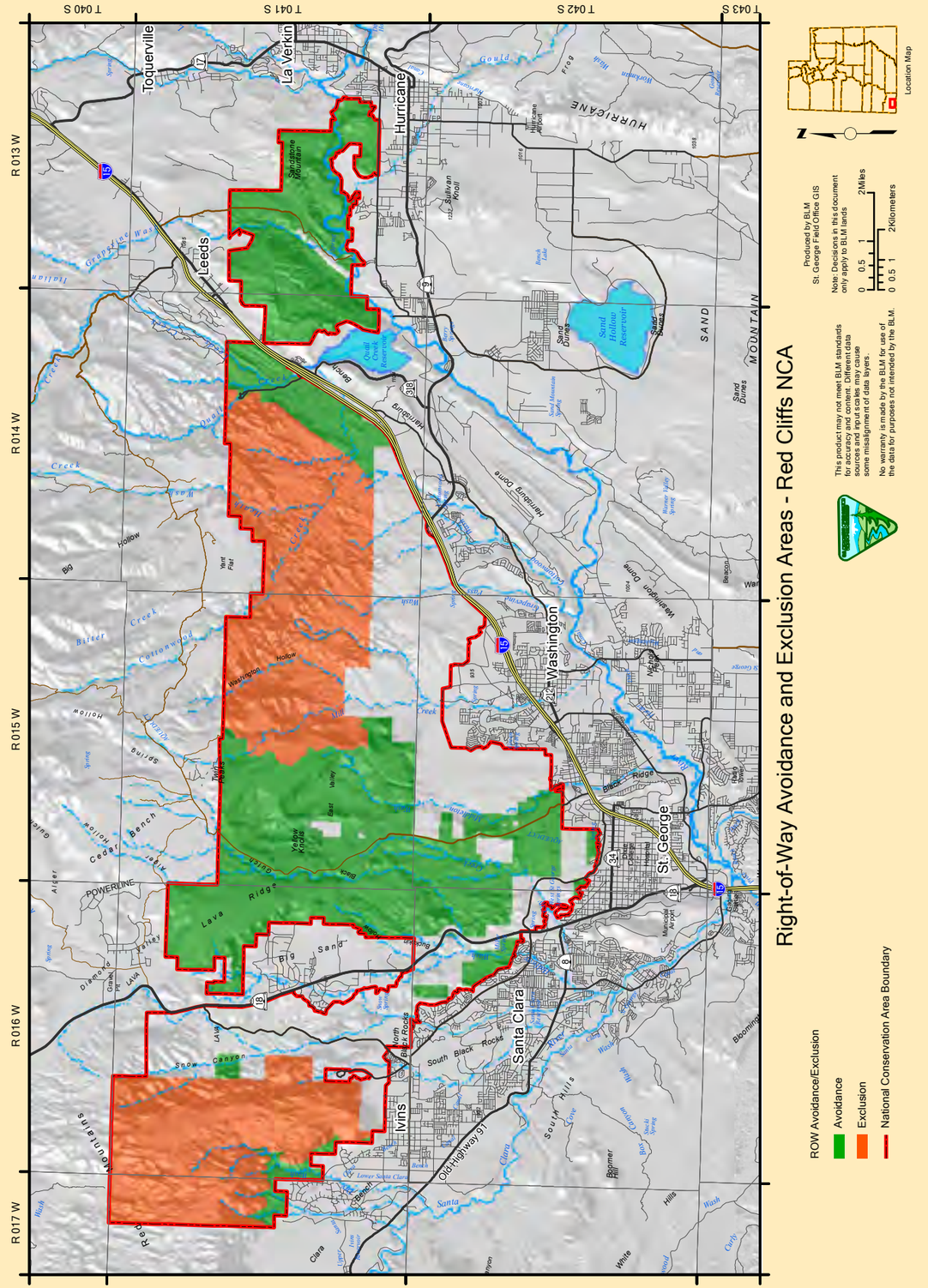
Note: Decisions in this document only apply to BLM lands

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

Location Map



Right-of-Way Avoidance and Exclusion Areas - Red Cliffs NCA

ROW Avoidance/Exclusion
- Avoidance
- Exclusion
- National Conservation Area Boundary

Location Map

Produced by BLM
St. George Field Office GIS

Note: Decisions in this document only apply to BLM lands

0 0.5 1 2 Miles
0 0.5 1 2 Kilometers

This product may not meet BLM standards for accuracy and content. Different data sources and input scales may cause some misalignment of data layers.

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

ROW Exclusion areas stated that new ROWs would only be granted in these areas when required by law or federal court action (BLM 1999).

The 1999 SGFO RMP designated two utility corridors that cross the NCA. One of these followed State Route 18 from St. George to Veyo, with the width of the corridor identified as the "currently fenced road right-of way" (BLM 1999). The second designated corridor was discontiguous and irregularly shaped to include all of the public lands along the I-15 corridor, from Ash Creek Reservoir south to Harrisburg Junction. A portion of this corridor crosses the NCA near White Reef and the Harrisburg Bench.

Prior to 1999, a number of linear and site type ROWs had been granted by BLM across public lands that are today within the Red Cliffs NCA. Table 3-47 provides additional information about these ROWs and the purposes for which they were granted.

3.42.3 Other Land Use Authorizations

Commercial film permits comprise the majority of the requested land use authorizations in the NCA. Over the past 10 years approximately 2-3 applications per year for filming permits have been received for the Babylon area of the NCA. Film permits in the NCA are subject to

Table 3-47 Existing ROWs in the Red Cliffs NCA

ROW Type	Company	Number	Length (Feet)	Width (Feet)	Approximate Total Acres
Fiber Optic Line	Qwest	UTU-79729	3,000	10	0.69
Gas Pipeline	Questar	UTU-67785	3,000	50	3.44
Fiber Optic Line	Charter/Baha	UTU-80882	58,266	30	40.13
Power Line	PacifiCorp	UTU-71709	58,266	50	66.88
Power Line	UAMPS	UTU-65460	41,500	100	95.27
Power Line	PacifiCorp	UTU-13694	41,500	50	47.64
Water Pipeline	City of St. George	UTSL-034813	87,120	20	40
Power Line	City of St. George	UTU-62302	45,580	20	20.93
Power Line	PacifiCorp	UTU-43908	7,174	20	3.3
Road	Virgin River Land Preservation	UTU-65437	14,837	36	12.26
Water Pipeline	Virgin River Land Preservation	UTU-65446	1,320	10	0.3
Stream Gage	USGS	UTU-85366	5	5	0.0006
Power Line	Hurricane City	UTU-87524	5,276.1	10	1.2
Road	Hurricane City	UTU-85627	6,150	44	6.2
Water Pipeline	WCWCD	UTU-51374	6,150	50	7.06
Power Line	PacifiCorp	UTU-68896	1,697.7	25	0.97
Weather Gage	BLM	UTU-87847	24	24	0.013
Weather Gage	Nat. Weather Service	UTU-87848	24	24	0.013
Water Pipeline	Sunbelt	UTU-55662	100	10	0.023
Underground phone	Qwest	UTU-68595	2,568	10	0.59
Waterline reservation (Red Cliffs Recreation Area)	BLM	UTU-63291	4,864	24	2.68
Access road reservation (Red Cliffs Recreation Area)	BLM	UTU-46814	N/A	35	N/A
Underground phone	Qwest	UTU-47612	14,080	10	3.23
Gas Pipeline	Questar	UTU-67785	14,133	50	16.22
Highway 18	Fed. Highways	UTSL-062805	3,000	400	27.55

minimum impact requirements and site-specific NEPA analysis.

3.43 SOCIAL AND ECONOMIC CONDITIONS

The reader is referred to the Affected Environment for the Beaver Dam Wash NCA for information on Social and Economic Conditions in Washington County that relate to the Red Cliffs NCA. In that section is a summary of the most recent data available from 2012 or 2013 to describe the social and economic conditions that are relevant for this planning effort. The data generally reflect conditions and values for all public lands and uses managed by the SGFO in Washington County, although a separate summary is provided for Red Cliffs NCA where relevant data are available. The Socioeconomic Baseline Report (Pinkham 2012) upon which this summary is based is available online at: www.blmgov/nxld.

3.43.1 Red Cliffs NCA Social and Economic Conditions

As part of the overall economic benefits to the planning area, the NCA provides potential socioeconomic benefits in the following resources:

- Grazing on portions of three allotments (111 permitted livestock AUMs);
- Recreation, primarily dispersed (105,575 visits in 2013).

3.43.1.1 Health and Safety

While extensive inventories and remediation of abandoned mines in the East Reef area of the NCA have been conducted by the Utah Abandoned Mines Reclamation Program (Photo 3-168), other abandoned mines have recently been located that pose a public safety threat. Additional systematic inventory is needed to resolve this potential safety hazard. There are no known above ground or underground storage tanks or locations with hazardous wastes on public lands in the NCA.

Photo 3-168 Abandoned Toquerville Mine with Gate to Facilitate Bat Access, Red Cliffs NCA

"Don't put yourself or others at risk! Stay out and stay alive!"
–State of Utah Abandoned Mine Reclamation Program

Chapter 3: Affected Environment SGFO RMP Amendment

3.44 INTRODUCTION

This section provides descriptions of those resource values that could be impacted by the alternatives developed for the Amendment to the 1999 SGFO RMP. The Amendment is limited to two planning issues that address specific mandates from OPLMA. Each of the mandates is described below, with information on how the Amendment was drafted to address the Congressional requirements.

3.44.1 Planning Issue 1

OPLMA Section 1979 (a), directs the Secretary to "identify areas…where biological conservation is a priority; and undertake activities to conserve and restore plant and animal species and natural communities within such areas."

Satisfying OPLMA's mandate related to areas of public land where biological conservation is a priority could be accomplished through two approaches: 1) the administrative designation of new ACECs and the retention of existing ACEC designations; and 2) the implementation of special management for public lands identified by the public during scoping where biological conservation is a priority, but where the species present may not meet both the relevance and importance criteria required for ACEC designation.

While new ACECs could be designated in the NCAs, through the new RMPs, the SGFO RMP must be amended to make similar designations for public lands outside of the NCAs. During this planning effort, BLM solicited input from federal agencies, state and local governments, Indian tribes, and the public, to identify public lands in Washington County where biological conservation is a priority and where special management should be applied to conserve and restore plant and animal species and natural communities.

3.44.2 Planning Issue 2

OPLMA Section 1977 directs the Secretary (through BLM) to develop a "comprehensive travel and transportation management plan" for public lands in Washington County. Prior to the development of this plan, the SGFO RMP must be amended to modify certain existing OHV area designations (open, limited, or closed), to be consistent with BLM's National Management Strategy for Motorized OHV Use on Public Lands and related agency policies. Area designations provide the framework within which individual route designations are made, as BLM prepares the legislatively-mandated travel management plan for public lands in Washington County.

The resource descriptions provided here in the Affected Environment reflect the narrow scope of this Amendment. They provide information about the legal and regulatory framework that applies to each resource value or use, as well as past and current management practices. Many of the at-risk native plant and animal species and habitats that require special management occur in the Beaver Dam Wash and Red Cliffs NCAs, as well as on public lands outside the NCAs. Their life histories and habitat requirements have previously been described in the Affected Environment sections for the NCAs and are not repeated here. Where at-risk species have not been previously described in this chapter or there are differences in species population trends, habitat conditions, or other factors, these are included in the following sections.

"The great thing in this world is not so much where we are, but in what direction we are moving."
–Oliver Wendell Holmes, American Poet, 1809–1894

"Nothing is more priceless and more worthy of preservation than the rich array of animal life with which our country has been blessed."
–Richard Nixon, 37th President of the United States, 1913–1994

3.45 SPECIAL STATUS SPECIES

Because the BLM-managed public lands of Washington County are located at the convergence of major ecoregions (Map 3-64), many native species here are at the extremes of their historic ranges and tend to have less stable populations. Others have adapted to the unique ecological setting of the area and have evolved into distinctive species or subspecies that are endemic (found only in a certain locality or region) to Washington County.

This section describes those species (plants and animals) whose populations and habitats have declined to the point that federal action has been taken, under the authority of the ESA. These include any species that is listed, is a candidate for listing, or is proposed for listing, as threatened or endangered by USFWS under the provisions of the ESA.

Other species of concern that are considered by BLM to be special status species include plant, animal, or fish species that are identified by the BLM State Director in each state as sensitive. Sensitive species are described under a separate subsection of this chapter.

3.45.1 Special Status Plant Species: Threatened, Endangered, Candidate, and Species Proposed for Listing under ESA

Table 3-48 lists those five native plants that are found on public lands in Washington County and currently listed under the protection of the ESA on federally-managed lands. (Similar protections are not provided under the ESA for native plants on non-federal land).

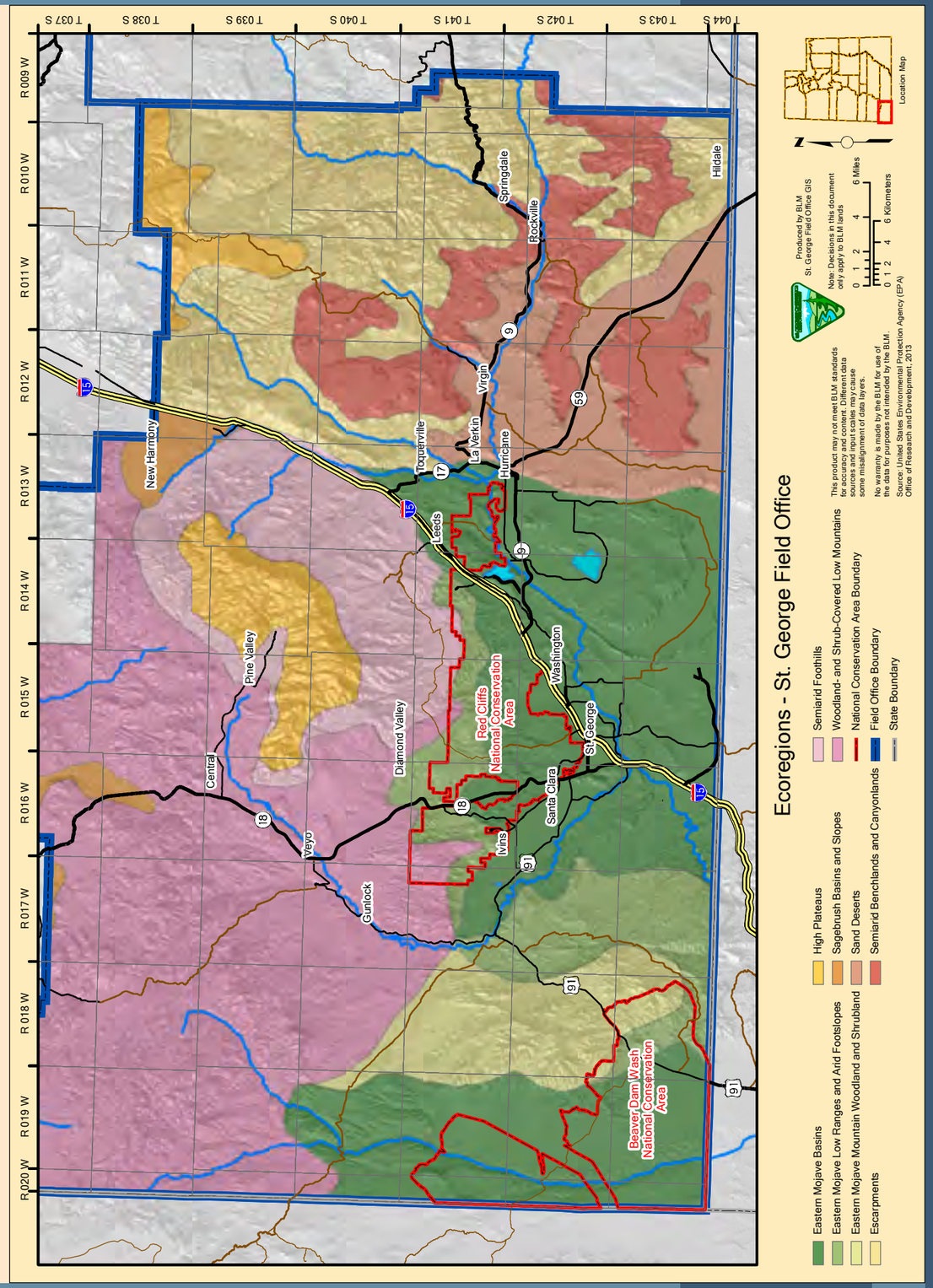
Descriptions of these special status plants and their habitats are provided below, where they have not been previously described in the Special Status Plant Species sections of the Affected Environments for the NCAs. Map 3-65 displays designated habitats for three threatened and endangered plants in Washington County. Map 3-66 shows population locations for all threatened and endangered plants in the planning area.

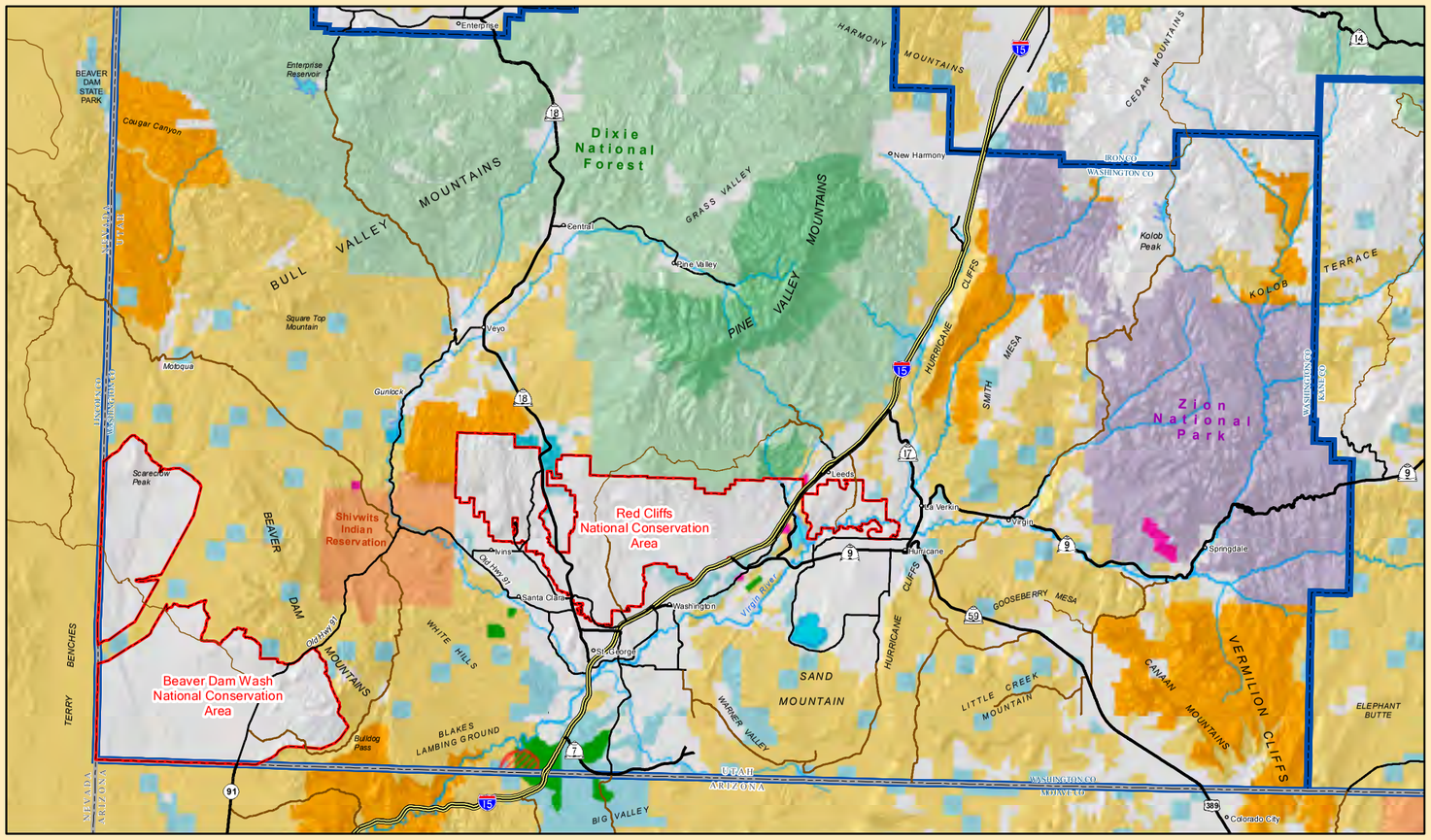
3.45.1.1 Dwarf Bearclaw Poppy

The dwarf bearclaw poppy (*Arctomecon humilis*) was listed as an endangered species by USFWS in1979, due to declining populations and habitat loss or alteration. This species is endemic to Washington County, Utah and occurs in the scattered locations shown in Table 3-49. It is a small perennial herb that grows on gypsum-rich soils derived from the Moenkopi Formation, often in association with the Creosote Bush-White Bursage community (UNHP 2005). The poppy blooms in late April or May, producing bright white flowers that are pollinated by as many as 12 species of native bees. Some of the bee pollinators that are important to the survival of this poppy are also declining in abundance and distribution. Intact biological soil crusts are also important to this plant, as they help to stabilize the often highly erodible gypsum soils that comprise the habitat for this endemic species. Monitoring data indicate that population densities of the poppy vary from year to year and by location, probably due to the amounts and timing of annual precipitation; population trends appear to be stable.

Table 3-48 Special Status Plant Species

Common Name	Scientific Name	Status
Dwarf Bearclaw Poppy	*Arctomecon humilis*	Endangered
Gierisch Globemallow	*Sphaeralcea gierischii*	Endangered
Holmgren Milkvetch	*Astragalus holmgreniorum*	Endangered
Shivwits Milkvetch	*Astragalus ampullarioides*	Endangered
Siler Pincushion Cactus	*Pediocactus sileri*	Threatened
Source: USFWS 2010		





Designated Critical Habitat - St. George Field Office

- Gierisch Globemallow Critical Habitat
- Shivwits Milkvetch Critical Habitat
- Holmgren Milkvetch Critical Habitat
- National Conservation Area Boundary
- Field Office Boundary
- State Boundary
- BLM Wilderness Area
- Bureau of Land Management
- Indian Reservation
- National Park Service
- State
- State Parks and Recreation
- State Wildlife Reserve/Management Area
- US Forest Service
- USFS Wilderness Area

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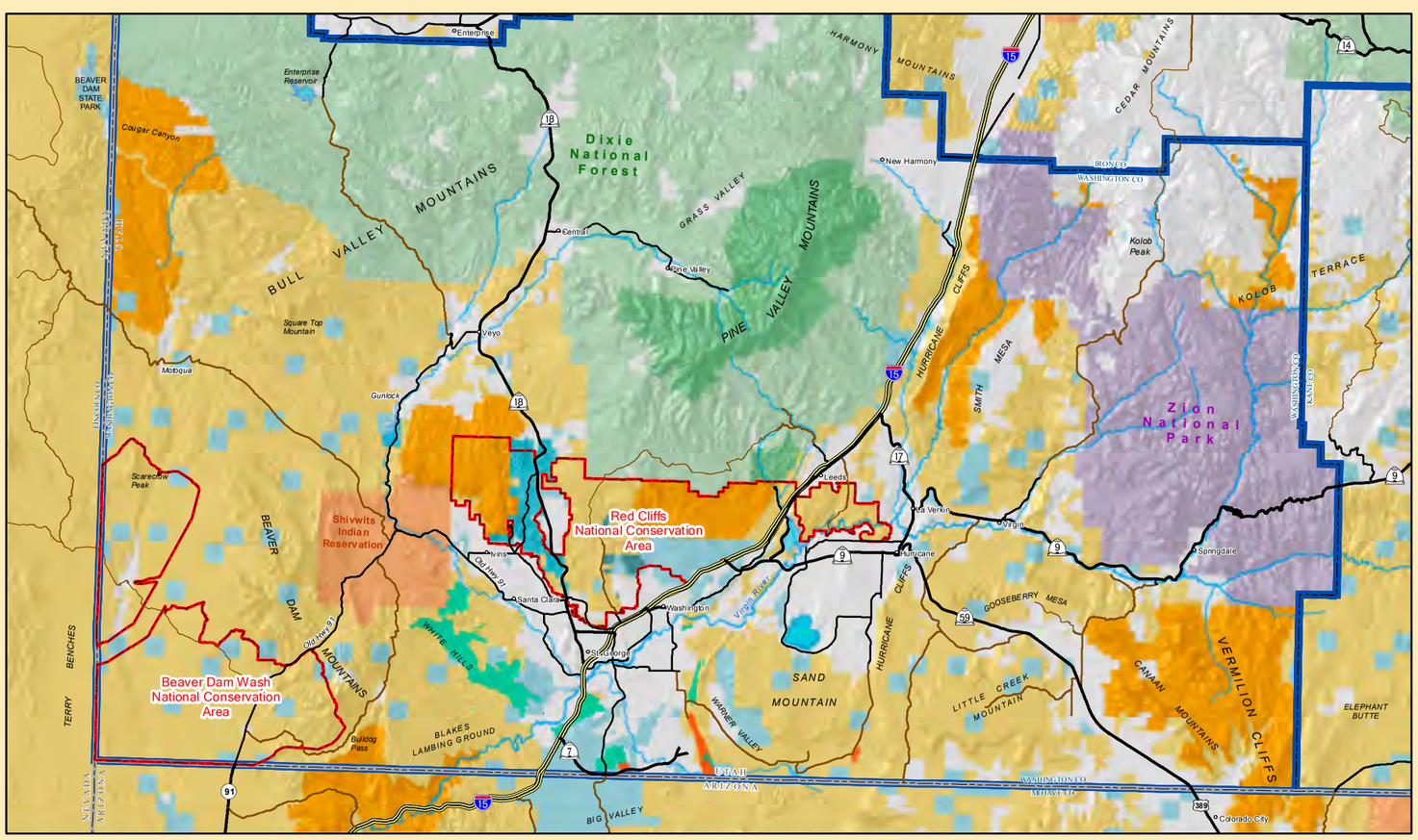
Location Map



Special Status Plant Populations - St. George Field Office

- Dwarf Bearclaw poppy
- Siler pincushion
- National Conservation Area Boundary
- Field Office Boundary
- State Boundary
- BLM Wilderness Area
- Bureau of Land Management
- Indian Reservation
- National Park Service
- State
- State Parks and Recreation
- State Wildlife Reserve/Management Area
- US Forest Service
- USFS Wilderness Area

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0 1 2 4 6 Miles
0 1 2 4 6 Kilometers

Location Map

3.45.1.2 Gierisch Globemallow

Gierisch globemallow (*Sphaeralcea gierischii*) was listed as an endangered species on August 13, 2013 and critical habitat was designated by USFWS at that time. This species is found near the Utah-Arizona border in Washington County and on the Arizona Strip. Approximately 1,015 acres of the species' critical habitat are managed by BLM, while 138 acres are managed by the State of Utah. Population numbers in Utah have been estimated at 3,000 to 5,000 plants, while in Arizona, estimated numbers are between 20,000 and 30,000 plants (Atwood and Welsh 2005).

This globemallow grows in association with the Creosote Bush-White Bursage community of the Mojave Desert, on soils derived from the gypsum-rich Harrisburg Member of the Kaibab Formation. Threats to this species include loss or damage to the plants and their habitats related to livestock grazing, OHV cross-country travel, and gypsum mining.

3.45.1.3 Holmgren Milkvetch

Holmgren milkvetch (*Astragalus holmgreniorum* (Photo 3-169) is endemic to Washington County, Utah and Mojave County, Arizona, and was listed as an endangered species in 2001. USFWS prepared a recovery plan and designated critical habitat for this species in 2006 (Table 3-50 for land status of designated critical habitat). Identified threats to the survival of this species include habitat loss to urban developments, OHV off-trail travel, livestock grazing, and habitat alteration by invasive exotic plants.

This small milkvetch grows on shallow, sparsely vegetated soils, derived primarily from the Virgin Limestone Member of the Moenkopi Formation. It is an extremely short-lived perennial herb, with low survivorship from germinated seedling to reproductive adult. The plants start growing in late February or early March and flower between March and April, setting fruit by the end of April. The plants die back to roots between late May and mid-June (Van Buren and Harper 2003). Native solitary bees are the primary pollinator of Holmgren milkvetch (Tepedino 2005).

Over the past 11 years, Utah Valley University has conducted monitoring studies at six study sites to determine population trends of Holmgren milkvetch (Van Buren and Harper 2006, 2007; Searle and Yates 2010). Data collected on population density at these sites showed considerable variability from year to year, probably due to the rates and timing of annual precipitation. Average population densities at the six sites varied from 0.0 to 0.75 plants per square meter, with an average of 0.24 plants per square meter over the 11 year period (Van Buren and Harper 2006, 2007; Searle and Yates 2010). Over the past several years, the overall trend of the populations appears to be in decline.

3.45.1.4 Shivwits Milkvetch

The legal and regulatory status of the Shivwits milkvetch (*Astragalus ampullarioides*) (Photo 3-170), an endangered species, was previously described under the Special Status Plant Species section of the Affected Environment for the Red Cliffs NCA and is not repeated here. The recovery plan (USFWS 2006) identified five populations of this species in Washington County; two additional populations (Dalton Wash and Cole Springs populations) were discovered in 2010 (USFWS 2010d). (Refer to Table 3-51 for location and land status of Shivwits milkvetch critical habitat.)

This species is endemic to Washington County and is known from only a few scattered locations, from Pahcoon Spring Wash on the west to Rockville Bench, Zion National Park on the east (USFWS 2006a). It grows only on the purple, clay and gypsum-rich soils of the Petrified Forest member of the Chinle Formation in warm desert shrub and pinyon-juniper communities (UNHP 2005). It is a

Holmgren Milkvetch

Astragalus holmgreniorum is endemic to the Mojave Desert in the vicinity of St. George, Utah. This member of the legume family grows in areas with small stone or gravel deposits largely in the Chinle and Moenkopi Formations. Blooming occurs between March and April, with its long seed pods beginning to appear in April.

Photo 3-169 Holmgren Milkvetch, Federally-Listed Endangered Species

Photo 3-170 Shivwits Milkvetch, Federally-Listed Endangered Species

Table 3-49 Land Status of Dwarf Bearclaw Poppy Habitat in Washington County

Population	Acres				
	BLM	State	Private	Tribal	Total
Beehive Dome	94	0	0	0	94
North Warner Ridge	375	0	0	0	375
Red Bluff	5,221	894	76	30	6,221
Shinob Kibe	59	0	0	0	59
Webb Hill	417	356	264	0	1,037
White Dome	0	362	535	0	897
Total	6,166	1,612	875	30	8,683

Table 3-50 Land Status of Holmgren Milkvetch Critical Habitat in Washington County

Population	Acres			
	BLM	State	Private	Total
State Line	1,093	365	10	1,468
Central Valley	0	607	12	619
Stucki Springs	142	0	0	142
South Hills	18	0	0	18
Purgatory Flat	3	0	0	3
Total	1,256	972	22	2,250

Table 3-51 Land Status of Shivwits Milkvetch Critical Habitat in Washington County

Population	Acres					
	BLM	State	Private	NPS	Tribal	Total
Silver Reef	9	0	0	0	0	9
Pahcoon Spring Wash	4	0	0	0	0	4
Shivwits	0	0	0	0	17	17
Coral Canyon	0	6	1	0	0	7
Harrisburg Junction	14	0	0	0	0	14
Zion National Park	0	0	0	37	0	37
Cole Springs	0.25	0	0	0	0	0.25
Dalton Wash	14	0	0	0	0	14
Total	41.25	6	1	37	17	102.25

Shivwits Milkvetch

Astragalus ampullarioides is a member of the legume family, as indicated by its pinnately compound leaves, keeled flowers, and fruit in the form of a pod. It grows between eight and twenty-six inches in height and produces numerous cream-colored flowers in April or May.

long-lived perennial that flowers from April to late May. Plants may grow each year, or go dormant in years of low rainfall. The primary pollinators of Shivwits milkvetch include several native bees that help to ensure reproduction within plant populations and gene flow between the populations (Tepedino 2005). Plant densities monitored over the past 10 years at the Pahcoon Spring Wash and Harrisburg Bench Study Sites (Searle and Yates 2010) suggest that Shivwits milkvetch populations have varied considerably from year to year, primarily due to precipitation, but that populations appear to be stable.

3.45.1.5 Siler Cactus

Siler cactus (*Pediocactus sileri*) (Photo 3-171) grows in Washington County, Utah, Kane County Utah, and Mohave County, Arizona. It was listed as an endangered species by the USFWS in 1979, but its status was changed to threatened in 1993. A recovery plan was completed for the Siler cactus in 1986. Threats to this species include impacts on plants from natural causes (e.g., drought, rodents, etc.), and habitat loss or alteration due to development, recreation, livestock grazing, and invasive annual grasses.

This cactus grows on the gypsum rich clay and sandy soils derived from the Moenkopi Formation, at elevations between 2,800 and 5,400 feet ASL, in the Mojave Desert shrub community. It is a small, solitary or occasionally clustered cactus about 4 inches tall and 3 to 4 inches in diameter.

Since 1985, populations of Siler cactus have been monitored in Utah and Arizona. Between 1986 and 2006, the Warner Ridge population in Washington County decreased in overall numbers (130 to 106), but the relative age-class distribution did not change measurably (USFWS 2008d). Plots in Arizona generally showed an overall decrease, with the greatest loss in the older age classes. Based on the information from the plots, populations in these areas are decreasing and show evidence of reduced recruitment. (Refer to Table 3-52 for the land status Siler Cactus populations in Washington County.)

Table 3-52 Land Status of Siler Cactus Habitat in Washington County

Population	Acres			
	BLM	Private	State	Total
Warner Ridge	699	3.5	1	703.5
Spendlove Well	84	0	0	84
White Dome	0	17	148	165
Total	783	20.5	149	952.5

Table 3-53 Special Status Wildlife Species

Common Name	Scientific Name	Status
Virgin River chub	*Gila seminude*	Endangered
Woundfin	*Plagopterus argentissimus*	Endangered
California condor	*Gymnogyps californianus*	Endangered[1]
Mexican spotted owl	*Strix occidentalis lucida*	Threatened
Southwestern willow flycatcher	*Empidonax traillii extimus*	Endangered
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	Threatened
Mojave desert tortoise	*Gopherus agassizii*	Threatened

[1]Only condors north and west of I-15; birds SE of I-15 are experimental, non-essential population

"Siler cactus grows on the gypsum rich clay and sandy soils derived from the Moenkopi Formation, at elevations between 2,800 and 5,400 feet ASL, in the Mojave Desert shrub community."

3.45.2 Special Status Wildlife Species: Threatened, Endangered, Candidate, and Species Proposed for Listing under ESA

Those species that occur on public lands in Washington County and that are currently listed under the ESA are shown in Table 3-53. With one exception (the Mexican spotted owl (*Strix occidentalis lucida*), each of these species is found in one or both of the NCAs; the life histories and habitat requirements for these species have previously been described under the special status species sections of the Affected Environments for the NCAs. Information on the Mexican spotted owl is provided below. Map 3-67 displays designated critical habitats for listed species that are outside of the NCAs.

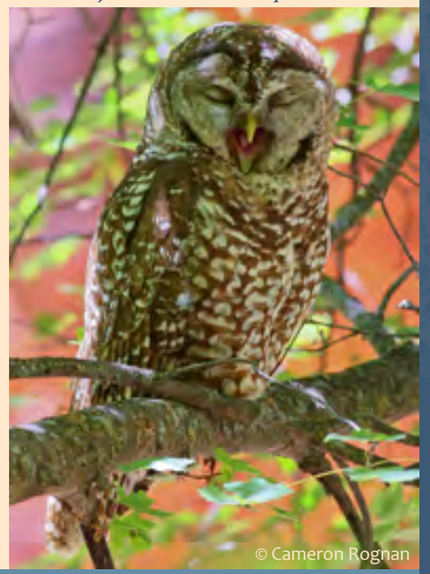
3.45.2.1 Mexican Spotted Owl

The Mexican spotted owl (Photo 3-172) was listed as a threatened species in 1993 and a recovery plan was completed in 1995. Critical habitat was designated by USFWS in 2001 and later modified in 2004. The critical habitat designation clarified that areas within critical habitat boundaries were only considered critical when they contain or have the potential to contain habitat characteristics essential to the conservation of the species (USFWS 2004a). Designated critical habitat was identified on BLM-managed public lands in northeastern Washington County, adjacent to Zion National Park. However, not all of these acres contain the primary constituent elements of habitat that are described in the 1995 recovery plan.

Mexican spotted owls appear to prefer steep-walled, rocky canyons where they nest in caves or on cliff ledges, in stick nests built by other birds, on debris platforms in trees, and in tree cavities (USFWS 2004a). One active spotted owl nesting site has been identified on BLM-managed public lands in the Kolob Creek drainage, with other locations identified in adjacent Zion National Park. Human activity (e.g., hiking, shooting, off-road vehicle activity) in or near nesting, roosting, or foraging sites may result in abandonment of an area by spotted owls, and indirectly may affect habitat suitability.

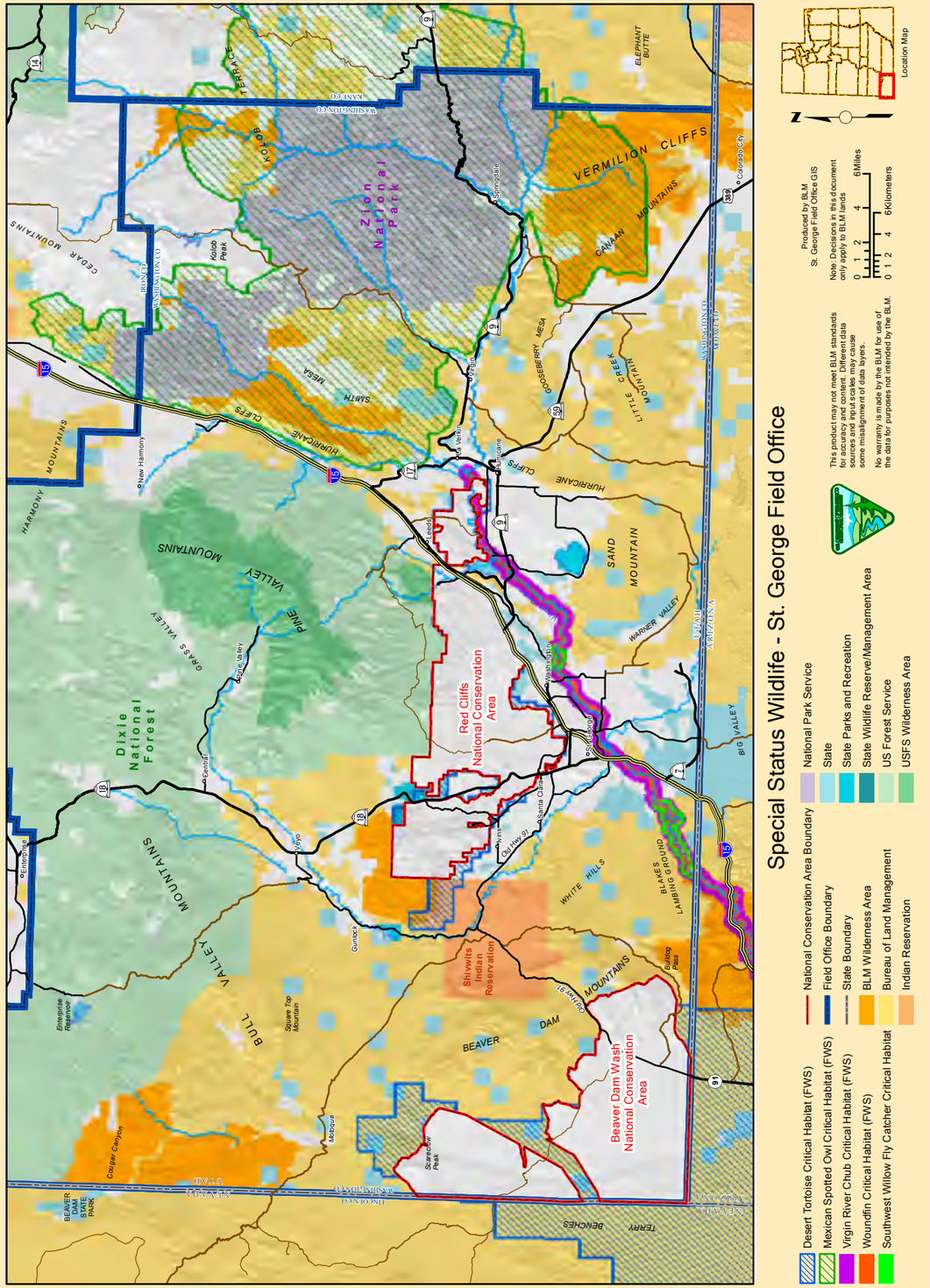
Photo 3-171 Siler Cactus, Federally-Listed Threatened Species

Photo 3-172 Mexican Spotted Owl, Federally-Listed Threatened Species



Mexican Spotted Owl

The *Strix occidentalis lucida* is one of three subspecies of spotted owls. Though it is the smallest of the spotted owls, it is one of the largest owls in North America. Most owls have eyes ranging in color from yellow to red-orange, but spotted owls are one of the few owls that have dark colored eyes. (Defenders of Wildlife 2014)



3.45.3 BLM Sensitive Species

3.45.3.1 Plants

This category of species includes those that are on the Utah BLM State Director's Sensitive Species list due to declining populations and habitat loss. Table 3-54 provides information on those BLM sensitive plant species that grow on public lands in Washington County, Utah.

Table 3-54 Habitats and Distribution of BLM Sensitive Plants in Washington County

Common Name	Scientific Name	Habitats
Aromatic Indian Breadroot	*Pediomelum aromaticum* var. *barneybyi*	Pinyon-juniper woodlands, in soils eroded from the Chinle Formation
Baird Evening Primrose	*Camissonia bairdii a.k.a. Chylismia scapoidea* ssp. *macrocarpa*	Blackbrush community and pinyon-juniper woodlands, between 3,900 to 4,300 feet elevations
Virgin Thistle	*Cirsium virginensis*	Seeps and hanging gardens
Diamond Valley Suncup	*Camissonia gouldii*	Slopes with scoria and lava flow surfaces, at 3.500 feet elevation
Diamond Valley Suncup	*Camissonia gouldii*	Slopes with scoria and lava flow surfaces, at 3,500 feet elevation
Wire-stemmed Wild Buckwheat	*Eriogonum pharnaceoides* var. *cervinum*	Pinyon-juniper woodlands
Escarpment Milkvetch	*Astragalus striatiflorus*	Sandy soils, on ledges and terraces in stream channels, various vegetation communities, between 4,900 to 6,600 feet elevations
Gumbo Milkvetch	*Astragalus ampullarius*	Clay-gypsum soils of Chinle Formation, between 3, 200 and 5,400 ft. elevations
Pine Valley Goldenbush	*Haplopappus crispus*	Mixed conifer/broadleaf forest
Nevada Willowherb	*Epilobium nevadense*	Base of cliffs and talus slopes, between 5,100 to 8,800 ft. elevations
Parry Sandpaper Plant	*Petalonyx parryii*	Creosote-bursage community, between 2,600 to 4,000 ft. elevations, on Chinle and Moenkopi Formation outcrops
Pinyon Penstemon	*Penstemon pinorum*	Pinyon-juniper woodlands, between 5,600 to 6,500 ft. elevations.

"Our task must be to free ourselves, by widening our circle of compassion to embrace all living creatures, and the whole of nature . . . and its beauty."
–Albert Einstein, Theoretical Physicist, 1879–1955

"True solitude is a ding of birdsong, seething leaves, whirling colors or a clamor of tracks in the snow."
– Edward Hoagland, American author, 1932–

3.45.3.2 Wildlife

Table 3-55 includes a list of all BLM sensitive wildlife species that are known to occur, or have the potential to occur, on public lands managed by BLM in Washington County. Information on a majority of these species has previously been provided in the Affected Environments for the NCAs and will not be repeated here.

Table 3-55 BLM Sensitive Wildlife Species

Common Name	Scientific Name
Bonneville cutthroat trout	*Oncorhynchus clarkiutah*
Desert sucker	*Catostomus clarki*
Flannel-mouth sucker	*Catostomus latipinnis*
Virgin spinedace	*Lepidomeda mollispinis*
American white pelican	*Pelecanus erythrorhynchos*
Bald eagle	*Haliaeetus leucocephalus*
Black swift	*Cypseloides niger*
Burrowing owl	*Athene cunicularia*
Ferruginous hawk	*Buteo regalis*
Lewis's woodpecker	*Melanerpes lewis*
Long-billed curlew	*Numenius americanus*
Northern goshawk	*Accipiter gentilis*
Short-eared owl	*Asio flammeus*
Three-toed woodpecker	*Picoides tridactylus*
Western burrowing owl	*Athene cunicularia hypogea*
Allen's big-eared bat	*Idionycteris phyllotis*
Big free-tailed bat	*Nyctinomops macrotis*
Fringed myotis	*Myotis thysanodes*
Kit fox	*Vulpes macrotis*
Spotted bat	*Euderma maculatum*
Townsend's big-eared bat	*Corynorhinus townsendii*
Western red bat	*Lasiurus blossevillii*
Common chuckwalla	*Sauromalus ater*
Desert iguana	*Dipsosaurus dorsalis*
Desert night lizard	*Xantusia vigilis*
Gila monster	*Heloderma suspectum*
Mojave rattlesnake	*Crotalus scutulatus*
Sidewinder	*Crotalus cerastes*
Speckled rattlesnake	*Crotalus mitchellii*
Western banded gecko	*Coleonyx variegates*
Western threadsnake	*Leptotyphlops humilis*
Zebra-tailed lizard	*Callisaurus draconoides*
Arizona toad	*Bufo microscaphus*

3.46 OTHER FISH AND WILDLIFE SPECIES

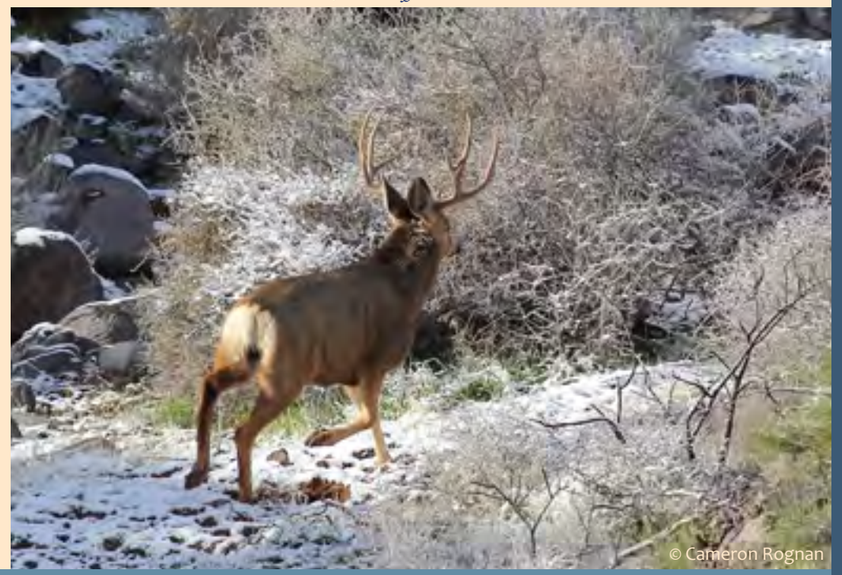
3.46.1 Mule Deer

The mule deer (Photo 3-173), named for its over-sized ears that resemble those of a mule, is a native species that is found throughout Washington County and the State of Utah. Mule deer consume a wide variety of plants but are primarily browsers on woody vegetation, such as serviceberry and sagebrush. During the winter, herds often move down from higher elevations, where snow may cover their forage, into valleys with less snow. Mule deer rarely travel far from water or forage, and often bed down near both. Does and fawns generally remain together in family groups; older bucks tend to travel alone or with other bucks. Besides humans, the leading predators of mule deer in Utah are coyotes and mountain lions, although bobcats (*Lynx rufus*), American black bears (*Ursus americanus*), and brown bears (*Ursus arctos*) may prey on fawns or scavenge deer carcasses. Healthy deer populations help to sustain predators and their natural role in functioning ecosystems.

While not a federally or state-listed species, mule deer are declining in numbers in Washington County and state-wide. UDWR has identified increasing mule deer herd numbers as one of its top priorities on a state-wide basis. The current UDWR deer-management plan (effective 2008-2013) identifies protecting and restoring crucial habitats as one of the most important measures that the agency and its partners can undertake to improve the health of mule deer populations.

Human population growth and urbanization, in concert with the effects of drought, climate change, large-scale wild fires, and invasive species proliferation, have reduced and negatively impacted mule deer habitat in Washington County. Public lands managed by BLM in Washington County provide 46,908 acres of crucial habitat, 87 acres of substantial year long range, 113,705 acres of crucial winter range (including 43,738 acres of fawning habitat) and 2,815 acres of crucial summer fawning habitat. Appropriate management of these acres will continue to be important to the maintenance and improvement of mule deer numbers. Large and undeveloped tracts of public lands also serve as an important migration corridor for mule

Photo 3-173 Mule Deer on the Move, Red Cliffs NCA



Mule Deer

Odocoileus hemionus is active throughout the day and night, being most active in early morning, late afternoon, and early evening (USFS 2014).

deer herds as they move between winter and summer ranges.

In the northwestern portion of Washington County, large numbers of mule deer move seasonally from summer range on the Dixie National Forest to crucial winter range on BLM-managed public lands at lower elevations. As the public lands are not crossed by highways, or otherwise encumbered by structures or facilities, herds can move safely across this landscape, making it a key migration corridor for mule deer and their natural predators (Map 3-68).

3.47 SPECIAL DESIGNATIONS

3.47.1 Areas of Critical Environmental Concern

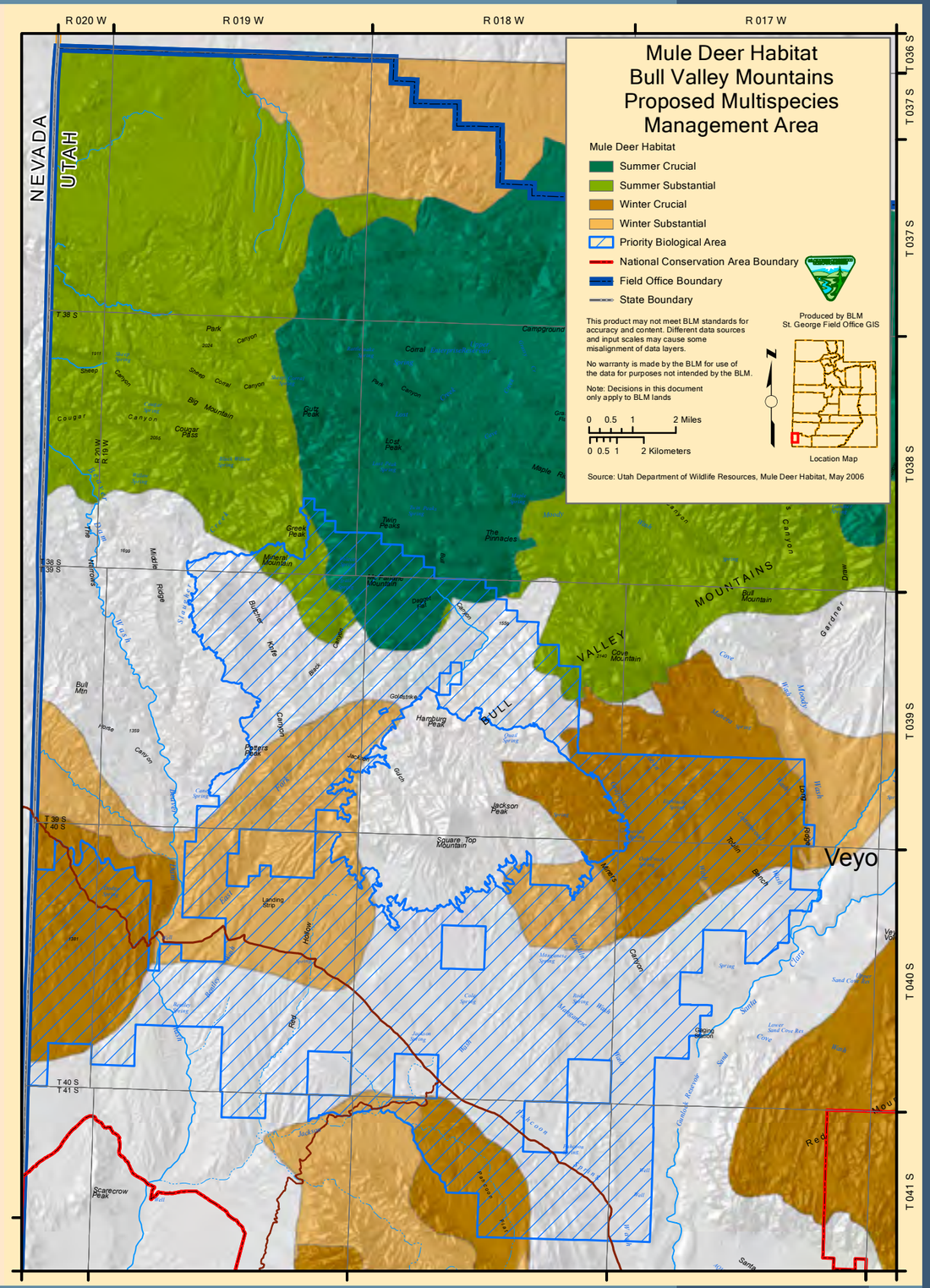
An Area of Critical Environmental Concern (ACEC) is defined in FLPMA, Section 103(a) as an area of BLM-administered public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards. BLM policies for implementing the ACEC provisions of FLPMA are found in 43 CFR 1610.7-2(b) and *BLM Manual 1613* (BLM 1988).

To be eligible for designation as an ACEC, an area must meet criteria for both relevance and importance. Relevance means that an ACEC possesses significant historic, cultural (Photo 3-174), or scenic values (Photo 3-175), fish or wildlife resources (including habitat, communities, or species), natural processes or systems, or natural hazards. Importance generally requires qualities of more than local significance and special worth, consequence, meaning, distinctiveness, or cause of concern. ACECs can also only be designated if the area's relevant and important values require special management attention. Special management attention refers to management prescriptions, developed during preparation of an RMP or RMP amendment, expressly designed to protect the important and relevant values of an area from the potential effects of actions permitted by the RMP, including proposed actions deemed to be in conformance with the terms, conditions, and decisions of the RMP. Such management measures would not be necessary or

"To be eligible for designation as an ACEC, an area must meet criteria for both relevance and importance."

Photo 3-174 Santa Clara/Land Hill ACEC

Photo 3-175 Canaan Mountain ACEC



"The SGFO RMP is being amended to modify certain existing OHV area designations to be consistent with BLM's National Management Strategy for Motorized OHV Use on Public Lands and related agency policies."

prescribed if the relevant and important features were not present.

Management prescriptions are designed to protect the values or serve the purposes for which the designation was made. Goals and objectives for each proposed ACEC are identified in the Chapter 2 alternatives for the Amendment to the St. George Field Office RMP, as are necessary constraints and mitigation measures. The Amendment to the SGFO RMP will identify a reasonable range of alternatives as well as management for newly-proposed ACECs.

3.47.1.1 Current ACECs

Ten ACECs, totaling approximately 153,000 acres, were administratively designated through the 1999 SGFO RMP. Table 3-56 provides information on the size of each ACEC and the relevance and importance values for which each was designated; Map 3-69 shows their locations.

The Beaver Dam Slope ACEC is located entirely within the Beaver Dam Wash NCA and was administratively designated prior to the Congressional designation of the NCA in 2009. The relevance and importance values and the management prescriptions of this ACEC were previously described under the Special Designation section of the Affected Environment for the Beaver Dam Wash NCA.

The Red Mountain ACEC is located partially within the Red Cliffs NCA and entirely within the Red Mountain Wilderness. The ACEC was administratively designated prior to the Congressional designations of both the NCA and the Wilderness area in 2009 through OPLMA.

3.48 COMPREHENSIVE TRAVEL AND TRANSPORTATION MANAGEMENT

3.48.1 OHV Area Designations

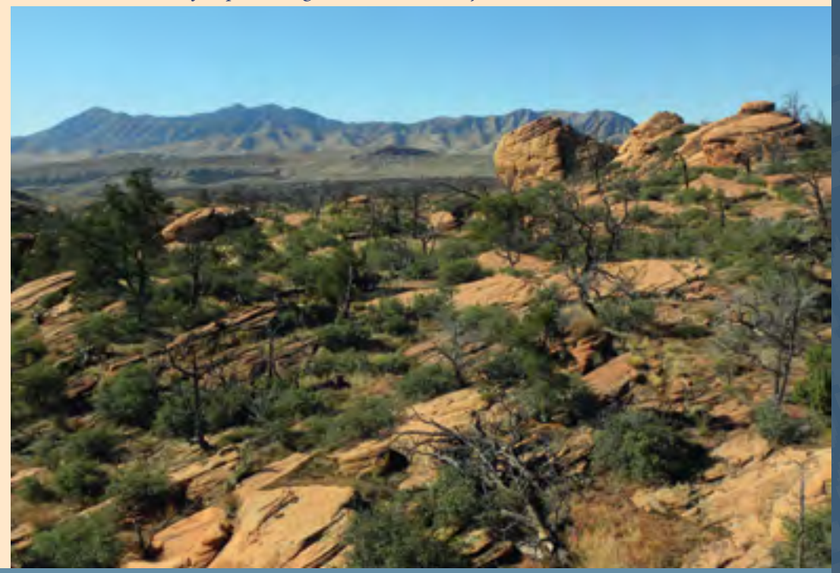
The SGFO RMP is being amended to modify certain existing OHV area designations (open, limited or closed) to be consistent with BLM's National Management Strategy for Motorized OHV Use on Public Lands (National Strategy) and related agency policies. Area designations provide the framework within which individual route designations are made, as BLM prepares the legislatively-mandated for public lands in Washington County.

Map 3-70 shows current OHV Area Designations for public lands in Washington County. One example of an existing OHV area designation that is not consistent with BLM's National Strategy is the large "open" area designated by the 1999 SGFO RMP in the northwestern area of Washington County. Open areas are designated where unregulated cross-country travel by all types of vehicles can be authorized, without resource impacts or degradation. In this particular "open" area in the Bull Valley Mountains (Photo 3-176), the mountainous terrain, deeply incised drainages, and heavily-forested slopes do not allow for safe and unregulated cross-country travel by all types of vehicles. This designation must be modified to be consistent with the National Strategy.

Table 3-56 Designated ACECs from 1999 SGFO RMP, Outside the Two NCAs

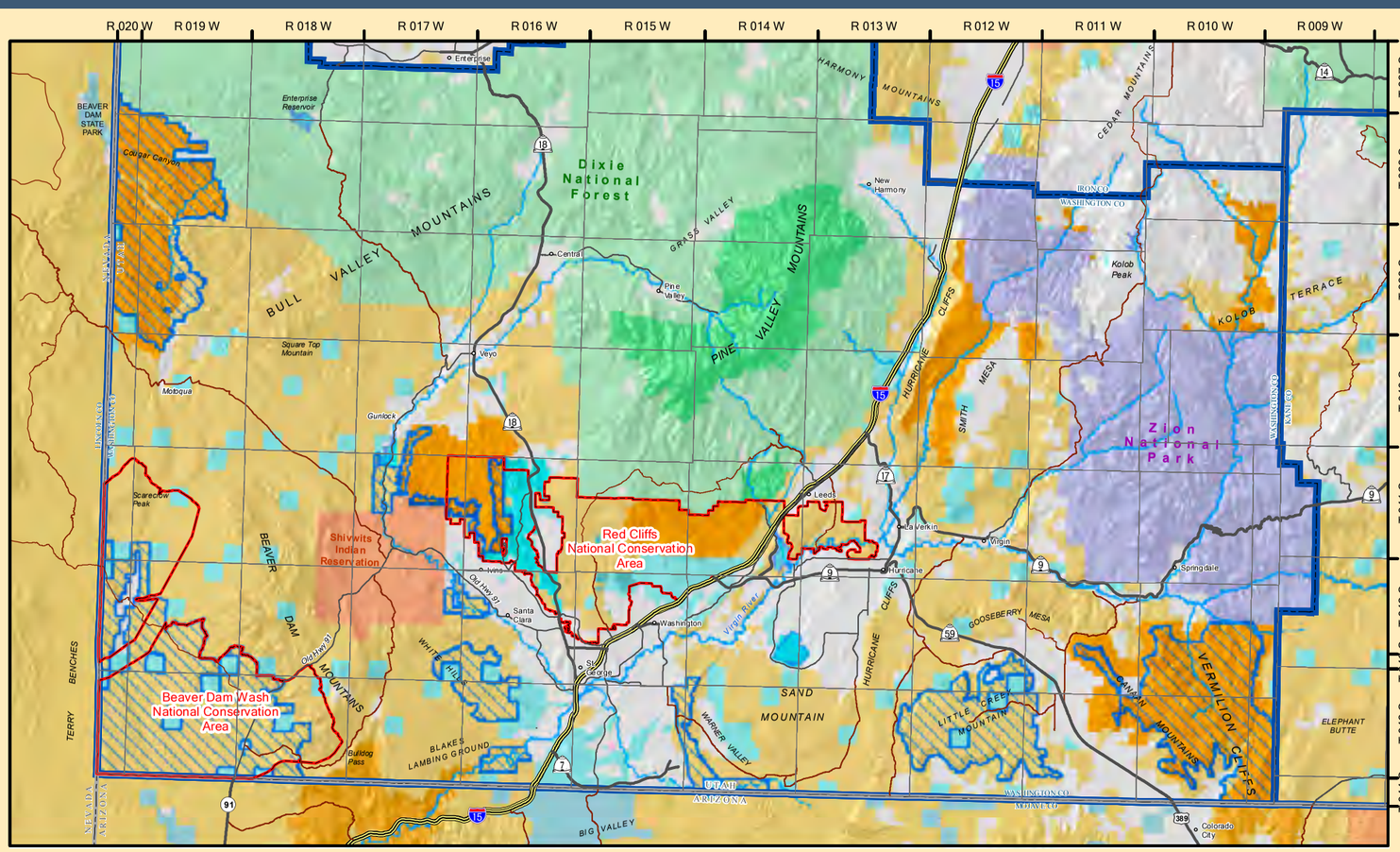
ACEC	Acres	Relevance And Importance Values
Red Bluff	6,166	Dwarf bearclaw poppy And Erodible Soils
Warner Ridge/Fort Pearce	4,286	Dwarf bearclaw poppy, Siler cactus, sensitive species, erodible soils
Santa Clara/Gunlock	2,002	Southwestern willow flycatcher, Virgin spinedace, riparian values, heritage resources
Santa Clara/Land Hill	1,664	Heritage resources, Southwestern willow flycatcher, Virgin spinedace, migratory birds, riparian values
Lower Virgin River	1,806	Woundfin minnow, desert chub, migratory birds, riparian values, heritage resources
Little Creek Mountain	19,331	Heritage resources, crucial mule deer winter range
Canaan Mountain	33,955	Scenic resources
Upper Beaver Dam Wash	33,108	Southwestern willow flycatcher, Virgin spinedace, riparian values
Total	102,317	

Photo 3-176 Area of "Open" Designation in Bull Valley Mountains



"Even if you're on the right track, you'll get run over if you just sit there."

–Will Rogers, Cowboy & Humorist, 1879–1935



Area of Critical Environmental Concern - St. George Field Office

- Existing ACEC
- National Conservation Area Boundary
- Field Office Boundary
- State Boundary

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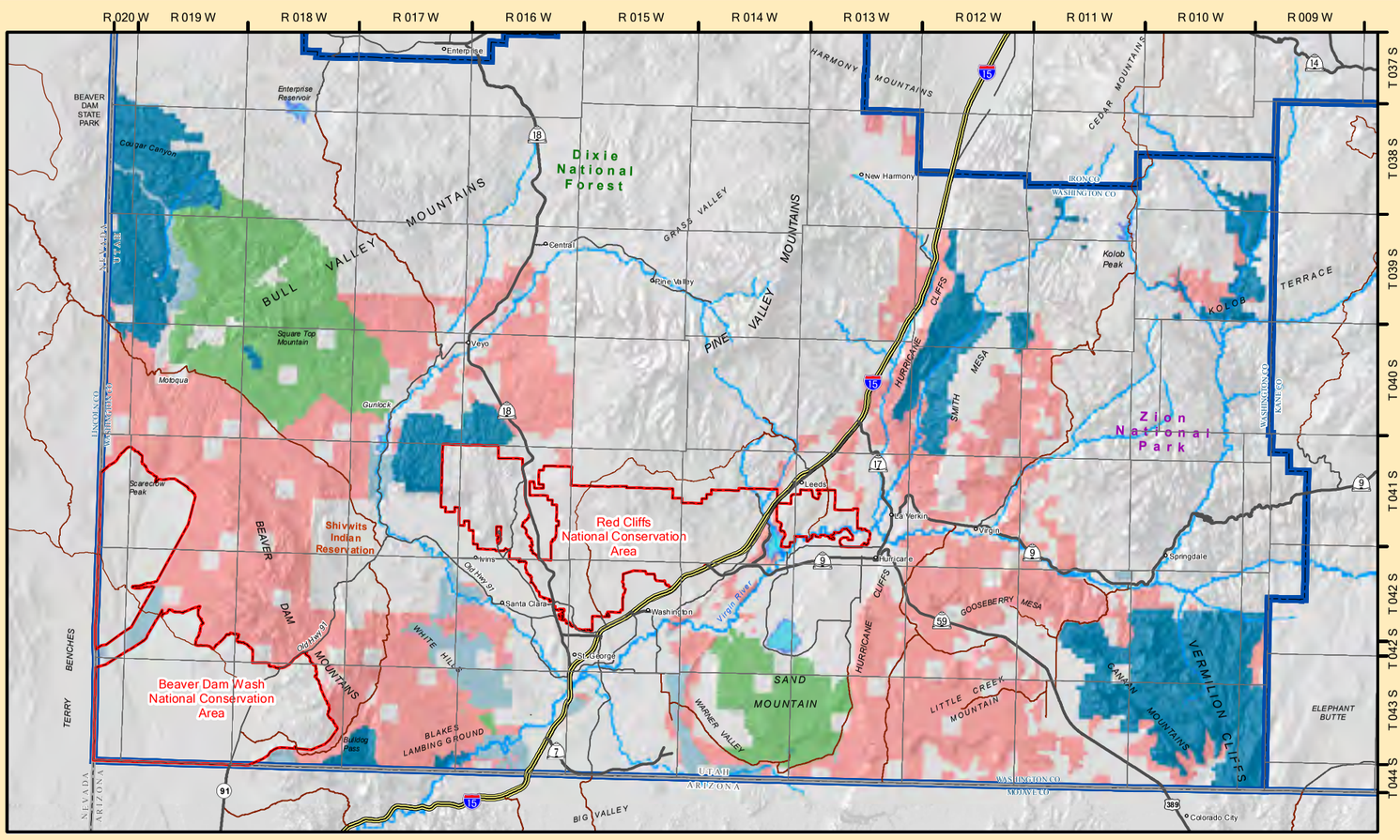
Location Map



OHV Area Designations - St. George Field Office

- Closed to Motorized Vehicles
- Limited to Designated Roads & Trails
- Limited to Existing Roads & Trails
- Open to All Vehicles
- National Conservation Area Boundary (Outside Plan Amendment Area)
- Field Office Boundary
- State Boundary

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Location Map